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Wisconsin. Dairy & food commission

FIRST ANNUAL REPORT

OF THE

State Dairy and Food Commissioner

OF

WISCONSIN.

1890.

MADISON, WISCONSIN,
DEMOCRAT PRINTING COMPANY, STATE PRINTERS,
1890.

WISCONSIN DAIRY AND FOOD COMMISSION.

H. C. THOM,	COMMISSIONER.
H. K. LOOMIS,	DAIRY EXPERT.
F. G. SHORT,	STATE CHEMIST.

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LETTER OF TRANSMITTAL.

MADISON, WIS., October 1, 1890.

To the Honorable, WILLIAM D. HOARD,
Governor of Wisconsin.

I have the honor to transmit herewith the annual report of the Dairy and Food Commissioner, in accordance with section 9, chapter 452, laws of 1889.

Very respectfully submitted,

H. C. THOM,
Commissioner.

REPORT OF THE COMMISSIONER.

The legislature of 1889 passed an act creating the office of Dairy and Food Commissioner for the state of Wisconsin. This act clearly defined the powers and duties of the office, with reference to administrating the laws which controlled the adulteration of all articles of food, drink or drug.

The powers and duties of the office are set forth in the following extract from chapter 452, laws of 1889:

SECTION 3. It shall be the duty of the commissioner to enforce all laws that now exist, or that may hereafter be enacted in this state, regarding the production, manufacture or sale of dairy products, or the adulteration of any article of food or drink or of any drug; and personally or by his assistants to inspect any article of milk, butter, cheese, lard, syrup, coffee or tea, or other article of food or drink or drug, made or offered for sale within this state which he may suspect or have reason to believe to be impure, unhealthful, adulterated, or counterfeit, and to prosecute, or cause to be prosecuted, any person or persons, firm or firms, corporation or corporations, engaged in the manufacture or sale of any adulterated or counterfeit article or articles of food or drink or drug, contrary to the laws of this state.

SECTION 4. Said commissioner or any assistant shall have power in the performance of his official duties to enter into any creamery, factory, store, salesroom or other place or building where he has reason to believe that any food or drink or drug is made, prepared, sold or offered for sale, and to open any cask, tub, package or receptacle of any kind containing, or supposed to contain, any such article, and to examine or cause to be examined and analyzed the contents thereof, and the commissioner or any of his assistants may seize or take any article of food or drink or drug for analysis, but if the person from whom such sample is taken shall request him to do so he shall at the same time, and in the presence of the person from whom such property is taken, securely seal up two samples of the article seized or taken, the one of which shall be for examination or analysis under the direction of the commissioner, and the other of which shall be delivered to the person from whom the articles were taken. And any person who shall obstruct the commissioner or any of his assistants by refusing to allow him entrance to any place which he desires to enter in the discharge of his official duty, or who refuses to deliver to him a sample of any article of food or drink or drug made, sold, offered or exposed for sale by such person, when the same is requested and when the value thereof is tendered, shall be deemed guilty of a misdemeanor punishable by a fine of not exceeding twenty-five dollars for the first offense and not exceeding five hundred dollars or less than fifty dollars for each subsequent offense.

SECTION 5. It shall be the duty of the district attorney in any county of the state, when called upon by the commissioner or any of his assistants to render any legal assistance in his power to execute the laws, and to prosecute cases arising under the provisions of this act, and all fines and assessments collected in any prosecution begun or caused to be begun by said commissioner or his assistants shall be paid into the state treasury.

SECTION 6. With the consent of the governor, the state board of health may submit to the commissioner, or to any of his assistants, samples of water or food or drink or drugs, for examination or analysis, and receive special reports showing the results of such examinations or analysis. And the governor may also authorize the commissioner or his assistants, when not otherwise employed in the duties of their offices, to render such assistance in the farmers' institutes, dairy and farmers' conventions, and the agricultural department of the university, as shall by the authorities be deemed advisable.

SECTION 7. The salaries of the commissioner and his assistants shall be paid out of the state treasury in the same manner as the salaries of other officers are paid, and their official expenses shall be paid at the end of each calendar month upon bills duly itemized and approved by the governor, and the amount necessary to pay such salaries and expenses is hereby appropriated annually.

SECTION 8. The commissioner may, under the direction of the governor, fit up a laboratory, with sufficient apparatus for making the analysis contemplated in this act, and for such purpose the sum of fifteen hundred dollars, or so much thereof as may be necessary, is hereby appropriated, and for the purpose of providing materials, and for other necessary expenses connected with the making of such analyses, there is also hereby appropriated so much as may be necessary, not exceeding six hundred dollars annually. The appropriations provided for in this section shall be drawn from the state treasury upon the certificates of the governor.

This act went into effect April 16, 1889. The commissioner received his appointment May 29, 1889. Pursuant to the provisions of this act Prof. F. G. Short, chemist of the state Experiment station was appointed state chemist, June 1, 1889. Prof. Short seemed eminently fitted for this work from his long experience in the work of analyzing dairy products. Another reason why Wisconsin should be glad to recognize his worth is that Prof. Short worked out a method of determining the butter fat in milk which has been adopted very largely throughout the United States and the old world.

Mr. H. K. Loomis was appointed dairy expert on the commission, July 9, 1889. Mr. Loomis has operated a large factory in Sheboygan county and has been an extensive dealer in dairy products. He has been treasurer of the State Dairyman's association for eight years, and for some time has had charge of the dairy department at the state fair.

There was no specific provision made for the location of a laboratory. For various reasons it was decided not to place it in the capitol building. There was no available room which was large enough and which furnished sufficient light for delicate and technical investigation. Again, various chemical compounds would be used and there would be more or less danger from explosion and fire. The state carries no insurance upon its property and we did not wish to enhance liability to damage from fire to the capitol by placing a chemical laboratory within its walls. A desirable place was found in the Pioneer building for a rental of $250 per annum. The laboratory is on the fourth floor, is well lighted and furnished with gas and water and heated with steam. An appropriation of $1,500 was made to equip a laboratory. This sum was found ample for this purpose. Prof. Short went directly to wholesalers in New York and succeeded in securing the necessary apparatus for about $250 less than the same invoice would have cost if it had been ordered from this point. The work of organizing the department was then begun. Unless one has given the matter careful consideration, no conception of the magnitude of the work can be estimated. By direction of the governor, the laws relating to the office and duties of the commission were compiled and 15,000 copies were distributed to manufacturers and dealers in food stuffs throughout the state. This was done because many of the laws were new and the old ones had never been enforced, consequently the trade was not prepared for the administration of them. The retail dealers throughout the state are in accord with the purposes of the department. In the main they are in utter ignorance of the character of many of the compounds which pass through their hands, and once cognizant of the fact that they are imposed upon by misrepresentation of manufacturers, they are not slow to withdraw their patronage. A prevailing opinion of the public has been that this department had to do altogether with the dairy interest. Although this is a great industry and should be wisely guarded by legislation the entire field of human food is comprehended by the scope of the duties of this office.

After the laboratory was furnished, the first work of the department was to take samples of the various food stuffs which were so mixed and compounded that they concealed their identity. The department was at first guided in its selection of samples by complaints and suggestions from various parts of the state. At the time of the creation of the office many sensational articles went the rounds of the press and several attempts were made to investigate. With but few exceptions, these attempts were futile, having originated in nearly every case, with some one who was either troubled with the dyspepsia or sold his wares by the line.

A more definite and sympathetic line of action was adopted. The first article which was given any considerable attention was vinegar. A large number of samples were taken from dealers and manufacturers in various parts of the state. The department soon discovered that nearly every vinegar that had a brown color was sold for pure cider vinegar and labeled as such. The analysis showed that but a very small percentage was cider vinegar as represented by the labels. The law was the next matter to consider. Here we found trouble. The section is quoted in full because it is the most important one which is comprehensive and general in its character.

SECTION 3. Every person who shall compound or put up for sale any food, drug or liquor, in casks, boxes, bottles or packages, with any label mark or device whatever, so as and with intent to mislead or deceive as to the true name, nature, kind and quality thereof, shall be liable to a pen-

alty of not to exceed five hundred dollars for the first offense, and for every offense after the first offense shall be punished by imprisonment in the state prison for not less than one year nor more than ten years.

It was evidently the purpose and intent of the legislature to make a violation of this section a criminal offense, because the second offense is punishable by imprisonment only. The word penalty, however, in the opinion of the attorney-general and the district attorney of Dane county, applies to forfeiture. In accordance with this opinion a civil action was begun against H. Grove & Sons, of Madison, for damages to the amount of $500, for selling a spirit vinegar under the name of cider vinegar. H. Grove & Sons, through their attorney, H. M. Lewis, entered a demurrer on the grounds that the offense was a misdemeanor. The demurrer was sustained by Judge Siebecker. A petition was filed by the attorney general that the case be placed on the calendar for immediate argument, for the reason that no other actions under this section could be begun until this point in contest had been settled. The petition was denied by the supreme court. This was a most unfortunate condition of affairs. Data for fifty cases under this section were at hand ready for use. Not one could be instituted until this controversy had been settled by a decision of the supreme court. Meantime when vinegar was falsely labeled the dealer was immediately notified by the following letter.

DEAR SIR:— October 1, 1889, Mr. Loomis, assistant commissioner took a sample of vinegar from your stock. A report upon the same by the state chemist shows that it does not conform to the laws of Wisconsin. Your attention is called to section 3, chapter 248, laws of 1879. You are hereby warned that a repetition of its sale, under its present brand, renders you liable to prosecution. Yours respectfully,

H. C. THOM, Commissioner."

If Mr. Loomis was able to learn who manufactured the vinegar a letter of the same tenor was directed to the manufacturer, provided he was a resident of the state. If the manufacturer resided outside the state and therefore not amenable to our law, he was notified that if he continued the sale of a falsely branded vinegar, his name and address would be published in the press of the state. When the dealers found out the situation of the matter, the office was flooded with letters, stating that they had been buying their goods in Chicago, St. Louis, Detroit and numerous other places, and wished to know how to protect themselves from buying specious goods.

Invariably the reply was made that their best protection was to buy of some reliable house, within the state, with a guarantee that the vinegar purchased should be as represented and would stand the test of the state chemist on this basis. This has been the policy of the department with nearly all classes of food stuffs, and the result is that the chemist has had more work on hand than he could dispose of. In many instances Dr. S. M. Babcock, chemist of the experiment station, has kindly given his assistance when work was crowding.

Again and again large invoices of goods have been held by merchants in Wisconsin, subject to the order of the wholesalers of other states, until word could be received that the analysis of samples corresponded with the guarantee under which the order was made. There are a number of wholesale houses in the state who make a regular practice of sending samples of new invoices to the laboratory, so that they may know just what character of goods they are distributing. The department has received much encouragement and assistance from the dealers, wholesalers and manufacturers. The people of Wisconsin are naturally law-abiding, and it has been our aim to have the laws complied with at the least possible expense to the individual and to the state.

The state of Wisconsin has become a great commonwealth with a thousand and one interests. The clamor of our people for cheaper food, for cheaper wear and for cheaper everything has had a pernicious result upon the purity of articles offered for sale by our tradesmen. The people ask for low-priced foods and in many cases the merchants are unable to supply the demand with an honest article, and fraud is resorted to. The merchants, in turn, must have the goods that are called for and the manufacturer is drawn into the gap and makes the spurious article. Although the public, in a large measure, is responsible for the situation, the state steps in and volunteers to protect the consumer. A man may cry never so loud for cheap foods, but an instance is yet to be cited where he has called for fraudulent food, and it is no more than just that he should receive what he assumes he is paying his money for. Again, the manufacturer of food stuff is taking the place of the producer of food. It is the duty of every state to protect the largest number possible. An honest manufacturer should be protected and fostered by every community, but a man who sails under false colors and makes an article with his eyes open and then sells it for what it is not, should be tried and condemned in the estimation of the people, to the extent of withdrawing patronage. A large part of fraudulent goods are made outside the state, where Wisconsin laws have no force, which is a great compliment to the honesty of Wisconsin manufacturers. The intent and purpose of the law is that this class of spurious food shall be placed beyond the reach of the comsumer. His health and longevity should be protected at any cost. Wisconsin men are becoming known for brawn and brain and the standard ought to be maintained. The consumer is an innocent buyer. He places forty cents on the counter and asks for a pound of coffee. His package should contain coffee and nothing else. If he asks for sugar he assumes that there is no glucose in it. If a farmer makes an honest pound of butter he cannot afford to throw it into the open market in competition with lard or tallow so manipulated that his city friend smacks his lips and pronounces it good butter even though his stomach revolts after he is asleep.

By careful estimate it has been demonstrated that the factory has supplanted at least twenty-five per cent. of honest production. It is a question of vital interest to honest manufacturers and honest producers that this infamous business be called to a halt. No state department can reach its utmost efficiency without the co-operation of the citizens of the state. If a perfect understanding could be established between the honest producer, the honest dealer, the honest consumer, the honest manufacturer, and this department, it would not be long before the representatives of illigitimate business would seek other employment.

Wisconsin is a broad and fertile state, capable of producing more than enough to keep in comfort, her 2,000,000 people. The channels of production and trade should not be so perverted that manufacturers outside the state may reap a profit on spurious articles of food which can be made in shops cheaper than the honest article can be grown by citizens and tax payers.

The laws of the department are weak in many respects. No decisions by the courts have been passed upon them. No attempt has been made, prior to the creation of the office, to administer them. "What is everybody's business is nobody's business." The first action brought by the department is yet to be argued before the supreme court for an interpretation of a technical point, not in the case, but in the law. The most important work for the first two years, is to test the laws that already exist, and formulating new ones. This end can only be brought about by jury trials and extensive analyses in the laboratory. Over 800 analyses have been made since the laboratory has been in working condition, up to the first of October. Such articles of food were selected for examination as were most likely to be degraded by imitation. Many remain uninvestigated, for the reason that the work was so arduous and extensive and so many demands were made by dealers and manufacturers, that the entire ground could not be covered in so limited a time. It is to be hoped that this work will be completed before the next session of the legislature. Under a provision of statute, the state board of health acts in conjunction with the commission, and furnishes samples of water and food to the department, which, in turn, makes a report of the analysis of the same, to the secretary of the board of health. This is a wise arrangement, because the work of the state board receives immediate attention without going to the trouble and expense of securing a competent chemist. The examination of water used by cities is very important. We have been importuned by many parties to analyze water which is used for private purposes, but in most cases, have declined to do so on the ground that it was not the function of this office to look after water that the state board of health had no reason to suspect contained ingredients that were injurieus to general health.

Section 5, chapter 452, laws of 1889 reads as follows:

> SECTION 5. It shall be the duty of the district attorney in any county of the state, when called upon by the commissioner or any of his assistants to render any legal assistance in his power to execute the laws, and to prosecute cases arising under the provisions of this act, and all fines and assessments collected in any prosecution begun or caused to be begun by said commissioner or his assistants, shall be paid into the state treasury.

Experience has clearly demonstrated that this is in part an inexpedient provision. Conceding that the department has received able counsel and efficient service from district attorneys, there are still good reasons why the commissioner should be empowered to select and pay his attorney. One lawyer can make a study of this particular work, and so equip himself, that, as an attorney, he is a credit on the prosecution in behalf of the state. District attorneys have never had court practice on cases of this kind. Upon ordinary criminal suits they would be masters of the situation, but when technical questions arise about butter fat in cheese, solids not fat in milk, specific gravity and acetic acid in vinegar and sulphates and chlorides in baking powders, it needs special preparation and long training to be successful in court. Again there may be some local opposition to the administration of the laws, and an attorney is necessarily more or less interested in the people of his own county, and perhaps unable to divest himself of certain prejudices. Then a district attorney is not overpaid by his county, and work that is put upon him by the state is only so much additional work, for which there is no provision for additional pay.

Much more systematic and satisfactory work could be done if a capable lawyer could be close at hand with whom the commissioner could consult at will. This method would be more economic from the fact that less time and less travel would be entailed in fixing dates and establishing a perfect understanding with the attorney. Every plan of action could be determined upon before a complaint was made out, which is impossible from the nature of things when the attorney is one or two hundred miles distant.

Again in some actions which the department has been very desirous to bring before courts, the district attorney has shown a spirit inimical to the just administration of the law. An element in some parts of the state has been found that is not in accord with the purposes of the commission, and this feeling must be dissipated before good results can be accomplished in these localities. The only way this can be brought about is by having the people thoroughly understand that the sole object of the department is to give the buyer exactly what he pays for, thus protecting his pocket book and his health, and at the same time place the manufacturers of spurious goods in such a position that they are unable to displace honest products by misrepresentation.

No one questions but that it is good commercial policy to foster home manufacture, and in no way can a more potent agent be employed than by urging retailers to patronize honest firms, within the confines of our own state.

We find that adulteration of many of our food products results in cheapening the products of the farm, thus lessening the profits of the husbandman and robbing both consumer and producer. The great evil lies in the practice of selling a cheapened article under a false name at the same price of the pure article, thus defrauding the producer out of the price which he might have received for the genuine product, while at the same time the consumer is made to pay for what he does not ask and what he does not want. The special agent of the United States department of agriculture very pertinently remarks: "It must not be forgotten that even though food be adulterated with matter not positively injurious to health, such food or drugs can not be as nutritious and wholesome as pure articles, and especially important does this feature of adulteration become in the matter of drugs used to cure or prevent disease. To be fed on debased and poisoned food, tainted or diseased meat, until the body sickens, is surely bad enough, without the efforts of the physician to prevent or allay disease being frustrated by his inability to secure unadulterated drugs and remedies fitted to do his work." A large correspondence from interested persons reveals the extent of adulterations, and without a single exception, unite in denouncing them as an outrage against the public health and the welfare of trade. The total value of food consumed in the United States, according to the *American Grocer,* is $4,500,000,000 annually. Mr. Wedderburn estimates that $675,000,000 of this $4,500,000,000 is displaced by the manufacturer of fraudulent food stuffs. This immense sum of money is simply stolen from the people each year by men who are cheating the consumers to enhance their own fortunes. Our export trade, of which such a large part consists of agricultural products, is also suffering from the same cause. Seventy-three per cent of our annual export grows upon the soil; $700,000,000 is received in America for goods shipped across the water. The United States has good reason to know that European governments are always ready to exclude or embarrass the American export trade and will avail themselves of every opportunity or pretext to do so.

On the other hand the countries of the old world have the most strenuous laws relating to adulteration and it is most unlikely that they will tolerate a class of food stuffs from America that are not allowed to be made at home. As a result of this America has been a dumping ground for goods of questionable character from Europe. This fact commended itself to the last congress and laws of protection against importation of fraudulent food stuffs are now to be found upon our statute books and the general sentiment upon the subject has become so strong that they will undoubtedly be enforced by the government.

All of the states that have taken legislative measures upon the subject of adulteration of food have urged upon congress the necessity of national laws to control this matter. If food standards are to be established it is obvious that the same standard should obtain in all states, otherwise manufacturers who have extensive trade would have great trouble in meeting unlike requirements in the several states.

In the month of November, 1889, a call was made to the dairy and food commissioners throughout the United States to meet in convention at Cleveland, Ohio. A national association was formed and a constitution adopted. The commissioner from Wisconsin was selected as president, and F. A. Derthick, commissioner of Ohio, was made secretary. The most important measure which came before the association was the framing of a pure food bill, which was forwarded to congress with an aim to secure national legislation which would affect all states alike.

Membership to the association can be obtained by persons who are described by the following section of the constitution:

"Any person who is connected with the dairy and food commission of any state as chief or assistant, or any person who is a member in good standing in a state dairy association, who presents credentials which show that such person is especially delegated by the board of directors of said state dairy association, or a member of the national, or any state board of health; or a person appointed by the governor of any state to represent the production of pure food in that state, may become a member of this association."

The governor of Illinois appointed a gentleman who represented the oleomargarine interest of that state, and he was promptly denied the privilege of becoming a member. Great good will emanate from this organization, which meets annually.

Commissioners can come together from the various states for the purpose of comparing laws and methods, perfecting the laws already existing and formulating new ones that are constantly demanded by the exigencies of trade.

A general outline of the work that has been done in this state and such suggestions as are of interest to the honest manufacturer and the consumer are respectfully submitted.

CITY MILK.

There is no article that is more generally used for food than milk. Nearly if not quite 60 per cent. of milk produced is consumed before being made into butter or cheese. It is of vital importance than an article which is used so extensively should be furnished in as wholesome and cleanly a condition as possible, and that it should be of that quality which the law contemplates when it says it shall contain at least 3 per cent. of butter fat. A dealer should be put in stocks who will distribute from door to door an inferior article which is so universally used by invalids and small children. The analysis of over 300 samples taken from every part of the state demonstrates the wisdom of fixing the standard at 3 per cent.

There have been found no herds in Wisconsin that fall below this mark, while the general average ranges from 3¼ to 4½. A careful perusal of the tables submitted by the chemist will be of interest to the general reader especially if he is the owner of one or more cows. The figures have a commercial significance which appeals to most men with a potent voice. One who has "profit" as a motto has little business in forming partnership with a cow that is not branded with "better than 3 per cent. of butter fat." A cow that skims her milk to less than 3 per cent. is amenable to the law and holds her owner responsible for damages. The opinion is gathering strength that they are less guilty cows in this respect than men. At the solicitation of the board of health, of Milwaukee, a number of samples of milk were taken in that city from wagons and milk depots. At the time the work was being done inquiries were made as to what kind of food the cows were getting. It was discovered that the health board of Milwaukee had taken active measures to suppress the feeding of brewery slops. This is a wise measure because this character of food has a material influence upon the quality of the milk produced. Brewery grains and malt sprouts are much better if they are fed while fresh and sweet. It was also discovered that inspectors regularlv visited the places where cows were kept that furnished the city with milk. This is the only city in the state where these precautions are taken, and the result is that Milwaukee is very fortunate in having, in the main, a wholesome and cleanly supply of milk.

Some of the samples fell below the 3 per cent. standard, and the following suits were instituted in the municipal court before Judge Walber.

Carle Oelke, found guilty, $10 and costs.
J. T. Drefhl, found guilty, $10 and costs.
Chas. Siegel, found guilty, $10 and costs.
C. L. Porath, found guilty, $10 and costs.
Waukesha Milk Co., found guilty, $10 and costs.
C. Willis, acquitted.
Ferdinand Meister, acquitted.
Thos. Kaemerling, jury trial; acquitted.

Four other parties fell slightly below the standard, but it was not deemed expedient to begin action against them. They were personally notified to furnish better milk. The prosecutions had a very desirable effect upon the entire city supply. Dr. Martin kindly gave the assistance of his inspectors and the use of his offices for analysis.

Letters have been received from many Milwaukee residents that milkmen were furnishing a better quality of milk and seemed very anxious that their customers should be satisfied. The general public was much interested and so many requests came to the office to have the list with the percentages published that the names of the dealers and a description of quality was given to the press. While this is the best possible method of controlling this matter, if all could be reported, there is an injustice to those who are doing an honest business and yet were not mentioned because no samples had been taken from them.

A partial list of baking powders was given to the public and immediately scores of protests were made to the effect that certain firms were manufacturing honest goods and they were not on the list, consequently their brand was not recognized. The same objection applies to milk dealers. If some method could be adopted so that all could be reached the person who handled an inferior article would soon go begging for patronage. This plan has been tried with splendid results in the city of London, Canada. The work was inaugurated about four years ago. The city council passed a by-law requiring every milk dealer to take out a license, paying therefor $1 annually, the standard of butter fat being fixed at 3½ per cent. as the lowest limit. This license is liable to be revoked at any time if the dealer fails to comply with the regulations. Ninety dealers and 1,200 cows came within the range of this inspection. Twice each year all milk is examined. Every herd is visited. The herd, the stable, the food and the water supply, is carefully looked after. A record of observation is taken. Twice a year a report of this examination of milk and inspection of surroundings is published in the city papers. No column of news is more closely read. The matron turns to the name of her milkman and if she reads "2½ per cent. of butter fat," "stables and cows filthy," "water supply poor," the poor fellow never forgets his next visit. The result is that the general average of the milk furnished contains over 3¾ per cent. of fat, and cramped and unclean stables have become more roomy and healthful, and greater care is exercised regarding food and water. If a similar system could be adopted in Wisconsin, the work could be carried on by this department. A dealer who holds a license and knows that it will be revoked if he does not comply with its requirements, will be very careful to do an honest, cleanly business. Then the office would be in possession of name, number and address, and when the list was completed it would be ready for publication. It would perhaps be unadvisable to have this regulation apply to cities under 2,000 inhabitants. The experience we have had with milk from villages demonstrates that it is, as a rule, uniform in quality and clean.

A number of the larger cities have been visited and the general supply has been examined as far as practicable. As will be seen by the examination of the tables submitted by the state chemist, the milk is of fair quality in nearly every city. Adam Thuerer, of Baraboo was arrested and found guilty of selling adulterated milk, and fined $10 and costs.

While the cases were in progress in Milwaukee, Judge Walber took occasion to say that the law for controlling the sale of city milk was a commendable one, and hoped all offenders would be prosecuted. The fine imposed was the minimum one that could be rendered, on the ground that the law was a new one and dealers had not been given sufficient time to acquaint themselves with its details. In every case the judge warned the defendants that upon a repetiton of the offense the penalty would be much more severe. It is our purpose to make a more extended examination of milk in Milwaukee as well as other cities at an early date.

FACTORY MILK.

The manufacturing of milk into butter and cheese has become one of the great industries of the state. Millions of dollars are invested in the business and thousands of farmers look to the income of the cow as their chief support. Over 1,200 factories, private and public, are in operation, and Wisconsin has secured an enviable reputation for turning out large quantities of first-class butter and cheese. The climate and pastures seem especially adapted to this branch of agriculture. That this branch of industry has been carried to such a successful issue is largely due to the work of the State Dairyman's association. This association has been fortunate in having among its members men of public spirit who have been animated to their great work by a devotion to the public good and an abiding faith that they were encouraging a business that would be profitable to the people, to the farms and to the state. The result of this singleness of purpose is clearly demonstrated by the rank Wisconsin takes among the states of the Union.

The legislature is to be commended for its co-operation and liberality in this connection.

The Farmers' Institute has been a powerful auxiliary in disseminating thought and skill in every county in the state, and is therefore entitled to no little credit for its assistance in establishing the reputation we enjoy as a state.

The Experiment Station has done yeoman's service in bringing home to the farmers the economic questions that enter so largely into farm management. To Wisconsin belongs the honor of establishing the first dairy school, and the instruction received by young men is a constant stream of information that promotes the intelligence of our dairymen. No one gainsays that the legitimate manufacture of butter and cheese should be protected by the administration of law. Chap. 425, laws of 1889:

SECTION 1. Any person who shall sell or offer for sale or furnish or deliver, or have in his possession, with intent to sell or offer for sale or furnish or deliver to any creamery, cheese factory, corporation, person or persons whatsoever, as pure, wholesome and unskimmed, any unmerchantable, adulterated, impure or unwholesome milk, shall upon conviction thereof, be punished by a fine of not less than ten nor more than one hundred dollars for each and every offense.

SECTION 2. In all prosecutions or other proceedings under this or any other law of this state relating to the sale or furnishing of milk, if it shall be proven that the milk sold or offered for sale, or furnished or delivered, or had in possession with intent to sell or offer for sale, or to furnish or deliver as aforesaid, as pure, wholesome and unskimmed, contains less than three per centum of pure butter fat, when subjected to chemical analysis or other satisfactory test, *or that it has been diluted* or any part of its cream abstracted, or that it or any part of it was drawn from cows known to the person complained of to have been within fifteen days before or four days after parturition, or to have any disease or ulcers or other running sores, then and in either case the said milk shall be held, deemed and adjudged to have been unmerchantable and adulterated, impure or unwholesome, as the case may be.

Numerous complaints have been made by factorymen, and so far as possible we have accommodated them by a personal inspection of the factories and examination of the milk. It is impossible to answer all demands. The State Dairyman's association has had four instructors at work the past two seasons. They have done much to lighten the work of this office and have rendered valuable service to the state in establishing better methods of manufacture, thus ensuring better returns for milk. These instructors report that the factories are in much more cleanly condition and greater skill has been acquired in handling milk under all conditions.

Several suits are now pending against parties who have been delivering skimmed or watered milk to factories.

The department takes every precaution to clearly establish a man's guilt before prosecution is begun. A sample of milk is tested by the chemist by the Short or the Babcock method, and if it is found to contain less than three per cent. of butter fat it is then given a careful chemical analysis. While this is going on the assistant commissioner visits the herd and takes a sample immediately after milking. This is tested at once. By comparing the results of the three analyses it can be determined at once whether the patron in question has been doing crooked business. Factorymen report that a visit from the officers have a marked effect upon the amount and quality of milk some of their patrons deliver.

The dairy boards are taking an active interest in this matter and are using every endeavor to have the factorymen protected. When the dairymen thoroughly understand that the profits of their business depend upon the character and quality of the milk they deliver to the factories, no other inducement but personal interest will be required to enable all factories to receive milk that comes from hands that are clean and honest. When once an even quality of milk is delivered to the butter and cheese makers Wisconsin goods will be more largely sought and command better prices than in the past.

CHEESE.

Sixty million pounds of cheese is annually made in this state. There is not an article of commerce that requires greater skill in handling in order to secure favorable markets. No industry has been so perverted. No business exists that has been so basely manipulated, and no article of food has been so degraded by counterfeiters. In no time has the honest manufacturer met with such dishonest competition. Matters have come to such a pass that the genuine article is under the ban of suspicion at home and abroad. The result has been that the subject has been thoroughly investigated by importers and steps have been taken to reduce the exportation of filled cheese from the United States. The following letters explain very clearly the action that has been taken in England regarding this matter, and how the nefarious business is regarded by the commissioners of the several states:

THE LIVERPOOL TRADE ASSOCIATION AND EXCHANGE COMPANY, LIMITED.
Secretary's Office, 24 *North John Street.*
LIVERPOOL, March 26, 1890.

DEAR SIR — We desire to inform you that a committee of the undersigned has been appointed by this association to watch the interests of the cheese trade, which are being seriously menaced by the continued increase in the manufacture of the article known as "filled" cheese.

We desire to co operate with you in the direction of obtaining such legislation as will lead to the suppression of the manufacture of this article.

The legitimate interests of the "Trade" are seriously imperiled, and the reasonable expectation of the consumer disappointed, and we are clearly of opinion that the distribution of "filled" cheese is disgusting the British public with the pure article, and that our Trade and mutual interests are in danger of suffering a permanent and lasting injury.

We are in communication with our Home Sanitary authorities, and are placing the matter before our Agricultural Government department, and members of the House of Commons.

We venture to suggest that you call upon your government and state Legislatures to prohibit the manufacture of these goods.

We would ask you to inform us what steps are being taken on your side, and what course should, in your opinion, be adopted to bring about the end we have in view.

We await the favor of your reply.

Yours faithfully,
W. CARSON, C. HOLLAND.
A. W. DUNN, T. LONSDALE,
J. L. GRANT, SAMUEL WHITE,
J. S. HARMOOD BANNER, *Secretary*

To H. C. THOM, Madison Wis.

REPORT

OF THE

COMMITTEE ON CHEESE,

OF THE

NEW YORK PRODUCE EXCHANGE,

IN RELATION TO "FILLED CHEESE."

THE LIVERPOOL PROVISION TRADE ASSOCIATION AND EXCHANGE COMPANY, LIMITED.

LIVERPOOL, January 8th, 1890.

DEAR SIR:

The directors of this association respectfully wish to draw the attention of your government to the exportation from the United States to the United Kingdom of what is termed "filled cheese."

This article is a compound of skim milk and grease, such as old butter, oleomargarine, or lard, the favorite ingredient being at present stale butter, on account of the belief of the manufacturers that they can thus defy the analyst.

My directors believe that this product is exceedingly harmful to the dairy farmers of your country. It is not the natural product of the cow, known as cheese. It is a well known fact that, for the past five years, since this fraud has been practiced, the price of pure cheese, instead of advancing in the spring months, has steadily declined.

This product is neither wholesome nor palatable, but is injurious to the American cheese trade, as it curtails consumption of the pure article, disgusting the community with American cheese as an article of food.

We believe the true remedy lies in prohibiting the production of filled cheese, which is manufactured in the western states, chiefly in Ohio, Illinois and Wisconsin. We are informed that New York state has prohibited its production.

We ask you for your assistance in this matter, and trust you will not only put this matter in the hands of the government, but suggest they should draw the attention of the dairy association and governors of the various states where this article is produced.

Your obedient servant,
J. L. HARMOOD BANNER,
Secretary.

THOMAS H. SHERMAN, ESQ., American Counsul, Liverpool.

UNITED STATES CONSULATE.
LIVERPOOL, January 13th, 1890.

HON. WILLIAM F. WHARTON,
Assistant Secretary of State,
WASHINGTON, D. C.

SIR.—At the request of the Liverpool Provision Trade Association and Exchange Co., Ld., I forward herein for your consideration a copy of a letter addressed to me by its secretary, inviting attention to the exportation from the United States to the United Kingdom of "filled cheese," an article compounded of inferior materials, and believed to be harmful to consumers and to the interest of honest dairy farmers in the United States.

The Association is informed that in New York, the production of this article is prohibited, and asks that the attention of the general government and the governments of other states, may be called to the matter. I am, sir,

Your obedient servant,
THOMAS H. SHERMAN,
Consul.

(Enclosure:)
MR. BANNER to MR. SHERMAN, 8th January, 1890.

DEPARTMENT OF STATE,
WASHINGTON, February 1, 1890.

THE HONORABLE THE SECRETARY OF THE TREASURY:

Sir.—I have the honor to transmit herewith enclosed copy of a despatch from the Consul at Liverpool, transmitting copy of a letter from the Liverpool Provision Trade Association and Exchange Company, relating to the exportation from the United States to the United Kingdom, of "filled cheese."

I have the honor to be, sir,
Your obedient servant,
JAMES G. BLAINE.

(Enclosure: From the Consul at Liverpool, No. 61. January 13, 1890.)

TREASURY DEPARTMENT.
Office of the Secretary.
WASHINGTON, D. C., Feb. 6th, 1890.

COLLECTOR OF CUSTOMS, New York, N. Y.:

Sir.— I transmit herewith copy of a letter dated the 1st instant from the Honorable the Secretary of State, and of its enclosed Despatch No. 61, dated the 13th ultimo, and accompanying letter, from the U. S. Consul at Liverpool, in relation to the exortation from the United States to the United Kingdom, of so-called "filled cheese," an article compounded of inferior materials, and believed to be harmful to consumers and to the interests of honest dairy farmers in the United States.

It is suggested that you place the enclosed papers before the proper officers of the produce exchange at New York for their information. Copies of the papers have been transmitted to the honorable the secretary of agriculture.

Respectfully yours,
GEO. S. BATCHELLER,
Acting Secretary,
A. K. T.

(Three enclosures.)

CUSTOM HOUSE, NEW YORK CITY,
COLLECTOR'S OFFICE, February 7, 1890.

CHAS. C. BURKE, ESQ.,
President New York Produce Exchange, New York City:

Sir— I transmit herewith a copy of a letter this day received by the collector from the secretary of the treasury, together with copies of a letter from the honorable, the secretary of state, and of its enclosures from the United States consul at Liverpool, which the collector is requested to submit for the consideration of your exchange.

Respectfully yours,
CHAS. P. MCCLELLAND,
Special Deputy Collector.

(Four enclosures.)

NEW YORK PRODUCE EXCHANGE,
NEW YORK February 10, 1890.

M. FOLSOM, ESQ.,
Chairman Committee on Cheese:

Dear Sir— At a meeting of the board of managers, held this day, the enclosed communication from Charles P. McClelland, special deputy collector, with communication from consul, at Liverpool, relative to the exportation from the United States to the United Kingdom of "filled cheese," was received and referred to your committee.

Yours very truly,

THOMAS P. WHITE,
Secretary.

NEW YORK, February 26th, 1890.

C. G. BURKE, ESQ.,
President New York Produce Exchange:

DEAR SIR — Your committee have the honor to acknowledge the receipt of the several communications concerning the adulteration of cheese emanating from the Liverpool Provision Trade Association and Exchange Company, Limited. The subject has had full and thorough investigation which its importance demands. This matter received the attention of the members of this exchange on February 23, 1887, upon which occasion the following preamble and resolutions were adopted:

> WHEREAS, Large quantities of cheese are being manufactured in some portions of the western states from milk from which the cream has been entirely extracted, by the separator process, and other animal and vegetable fats substituted for the butter so extracted; and,
>
> WHEREAS, These goods are being almost entirely exported to Great Britain without being stamped or branded so as to distinguish their true character, and which are calculated to deceive; and,
>
> WHEREAS, These spurious goods are working an injury to legitimate trade in cheese; therefore, be it
>
> *Resolved*, That the cheese trade of the New York Produce Exchange deem it their duty to expose and discountenance such frauds by every means in their power.
>
> *Resolved*, That we condemn the practice of adulterating cheese with animal or vegetable fats are demoralizing, and tending to create a prejudice in the markets of the world.
>
> *Resolved*, That the attention of the dairy commissioners be drawn to the above resolutions, with a request that they do all they can to enforce the laws in regard to the make and sale of imitation cheese.

Since when the vigilance exercised by the assistant dairy commissioners in this city has put a stop to the trade in filled cheese in this market. Your committee have communicated with the several dairy and food commissioners of the following states, to-wit: New York, New Jersey, Ohio, Wisconsin, Iowa, Minnesota and Connecticut. The state of Illinois, as far as we can ascertain, has no dairy commissioner. The letters received have gone into the subject thoroughly and fully, and we submit extracts from these bearing on the subject.

J. K. Brown, New York State Dairy Commissioner, under date of February 19th, says: "The statutes of this state do not in express terms prohibit the manufacture and sale of butter filled cheese. I am in favor of a national law, as well as a state law; the former would reach many cases which the latter could not, and whatever its provisions, they would be uniform, affecting all states alike. Any legislation tending to stop the tampering with dairy products is of the utmost importance, not only to the consumer, but to the producer as well, as it would help to restore and maintain the confidence necessary to a normal consumption of the product."

Wm. K. Newton, New Jersey Dairy and Food Commissioner, under date of February 17th, says: "I enclose a marked copy of the laws of this state relating to food. You will notice that 'filled cheese' may be sold if the box is properly marked and branded 'imitation cheese,' and at the time of sale the purchaser must be informed."

Henry Talcott, Assistant Dairy and Food commissioner for Ohio, writes under date of the 15th of February: "In answer to your questions: first, our law does prohiblt the manufacture of cheese out of any substance but pure milk, salt and harmless coloring matter; and I would punish a filled cheese manufacturer in Ohio very quick if such a one could be found; second, I would most heartily approve of a national law prohibiting it. Ohio is free from this stain of filled cheese."

H. C. Thom, Dairy and Food Commissioner for Wisconsin, states, under date of February 20th, that "the laws of this state do not prohibit the manufacture of filled cheese when said filling consists of butter. The laws of the state demand the branding only of full cream cheese. I am in favor of a national law that will prohibit the filling of cheese in any way. We have made it so very warm for parties in Wisconsin who have been filling cheese with low grade butter that the business has been discontinued, and I feel safe in saying that not a pound of filled cheese is being made in this state at the present date."

H. D. Sherman, Iowa state dairy commissioner, writes under date of February 17th: "I this day send you by mail a copy of our state dairy law. As you will see, it covers the adulteration of cheese the same as butter. I am most heartily and emphatically in favor of a national law that will cover all kinds of the detestable stuffed cheese. It is no better than oleomargarine, and should come under the same law of control."

Warren J. Ives, Minnesota state dairy and food commissioner, writes as follows: "Febuary 19th. Our laws does not permit the manufacture of filled cheese, even though filled with butter. I most certainly approve of a state as well as a national law with reference to filled cheese even more stringent, if possible, than the present oleomargarine law."

J. B. Tatem, state of Connecticut dairy commissioner, writes under date of February 21st: "Our state has no law which applies to cheese. I believe that a law similar to the oleomargarine law, so called, applied to cheese would prove a benefit to both producer and consumer.

From the foregoing it will be noticed that the laws of the states of New York, New Jersey and Wisconsin do not prohibit the manufacture of cheese filled or enriched with butter; while those of Ohio, Iowa, Minnesota, and we may add Pensylvania, prohibit filling of any kind.

Illinois, we understand, has no statutes on this important subject, and from the best information we can obtain, there are several firms manufacturing filled cheese in that state, of nearly every size and shape adapted the home trade and also for export; the latter are being consigned and shipped by the manufacturers direct to commission agents in Great Britan for sale; and, owing to more favorable rates of freight, are shipped via Portland, Boston, Philadelphia and Baltimore, few or none passing through this port. Regarding the quantity of filled cheese made in this state, we are of the opinion that the quantity is very much smaller than in previous years.

While it is the opinion of your committee that this article may have merit as a "cheap cut" when the price of best quality is high, and it has had strong scientific endorsement in Europe. The manufacture of filled cheese is, we are informed, carried on to a considerable extent both in Norway and Scotland. We would certainly recommend the enactment of a national law regulating the manufacture and sale of this article by the imposition of a nominal tax on manufacturers sufficient to cover the expense incurred, and that the tax and supervision be imposed and collected in the same form and manner as is now in force under the act regulating the manufacture and sale of oleomargarine.

We attach herewith the correspondence referred to, and also copies of the different state laws as furnished to us, all of which is respectfully submitted.

M. FOLSOM,
W. E. SMITH,
S. W. DOTY,
THOMAS BAMBER,
ALFRED C. H. FROEMCKE,
Committee on Cheese.

NEW YORK, February 27, 1890.

At a meeting of the board of managers of the New York Produce Exchange, held this day, the foregoing report of the committee on cheese was received and approved.

THOMAS P. WHITE,
Secretary.

The letter from Wisconsin states that no filled cheese was being made at that time of the year, February 20th. Information has since come to the office that parties are contemplating resuming the practice as soon as the markets would warrant. There is a patent on the process of making cheese with so-called enriched milk; that is, milk with butter run into it, owned by parties in New York. The attorneys and western agent for the company holding the patent have assured this office that no more licenses would be granted in Wisconsin, but a man that will evade a state law by filling with poor butter instead of with good hogs' lard will violate a patent law with the same easy conscience.

Chapter 424, laws of 1889, reads as follows:

> SECTION 1. No person shall manufacture, mix or compound with or add to natural milk, cream or butter, any animal fats or animal or vegetable oils, nor shall he make or manufacture any oleaginous substance not produced from milk or cream, with intent to sell the same for butter or cheese made from unadulterated milk or cream, or have the same in his possession or offer the same for sale with such intent, nor shall any article or substance or compound so made or produced be sold intentionally or otherwise as and for butter or cheese the product of the dairy. Whoever violates any of the provisions of this section shall be guilty of a misdemeanor, and be punished by a fine of not less than fifty dollars ($50), nor more than five hundred dollars ($500).

A careful reading of this law shows that filling cheese with any substance not produced from milk is prohibited. The framers of this law did not presume that Wisconsin had men who would evade the letter of this law by putting stale butter into skim milk and make cheese of the mixture.

Factorymen within the confines of the state have hauled skim milk in wagons six miles into Illinois and there added foreign fats to make filled cheese, but no one had been discovered who would buy store grease, soak it into cheese and call it the natural product of the cow. They had not been discovered perhaps, because men who are willing to ruin a state industry for slight personal gain are too small to be seen without the closest scrutiny. In 1884, the United States sent 150,000,000 pounds of cheese to foreign ports. No year since has so much been sent abroad. There must be some reason for this restriction of trade. Cheese is an article more appreciated and a product of more popular consumption in European countries than in our own. It is a staple food largely taking the place of meat which the poorer classes find themselves unable to afford.

Good cheese makes a diet, wholesome, nourishing and comparatively cheap. Under these circumstances it is natural that we should develop a large trade, and if the reputation of our product had been maintained, the next decade would show an expansion of the trade quite as remarkable as did the past. With constantly improving dairy stock and methods, with our wonderful resources in cheap and abundant pasturage, with the tendency toward concentrated effort and massing of capital, resulting in a uniform grade of product at a cheaper cost of production, we should be able to supply the old world with such a good article that to have it once would create a continuous demand. "At the present time," says an eminent writer, "when complaints in the depression in American agriculture are everywhere heard, the value of such a foreign demand for our surplus products ought to be appreciated, and all possible means should be used to cater to the demand and extend our trade." The exportation of agricultural products is most profitable when the items represent the greatest value in the least bulk. Double profits are made when grasses and grains are sold in the shape of dairy products. The transformation takes place at home, maintaining the fertility of the soil, giving additional employment to farm labor, and reducing to a minimum the cost of transportation. What have we done to show that we appreciated the demand and the condition of affairs? Are we not getting out the gun to kill the goose that laid the golden egg? Nothing in the world brought about the depression of the foreign butter market but the flooding of distant docks with oleomargarine. Germany claimed that our pork was not all right. What a wail went up from our people. Too much could not be done to set the matter right. The man who was delivering milk from thirty cows to make filled cheese raised his voice to heaven because Germany refused to buy his one pig. Why are not our dairymen sharp enough to keep American cheese above suspicion? Milk brings a few cents more per hundred for a short time but the day of judgment is close at hand. A consumer buys a pound of fraud and forever after distrusts all cheese. We thus lose home patronage, and we turn to Europe for relief. We fooled her once about taking some tea, but she is too sharp to be caught on our poor cheese. It is much more difficult to regain a lost reputation than to lose one. The branding of cheese is provided for in the following section: Chapter 240, laws of 1887, as amended by chapter 455, laws of 1889.

> SECTION 1. Every person who shall at any cheese factory in the state, manufacture any cheese shall distinctly and durably stamp or mark upon each and every box, case or package of cheese manufactured and sold, the name and location of the cheese factory at which the same was made, and all cheese made from milk, containing three per centum or more of pure butter fat, shall be branded as full cream. And if any manufacturer of cheese shall sell or dispose of any cheese without such stamp or mark, or shall falsely stamp or mark the same as full cream, when made from milk containing less than three per centum of pure butter fat, he shall forfeit and pay to any person who shall prosecute for the same the sum of twenty dollars for every box, case or package of cheese sold or disposed of without being marked as prescribed in this act or with a false mark thereon, to be recovered in a civil action in any court having jurisdiction of the person and subject matter, one-half of such penalty to be paid into the county treasury of the county in which such action is brought, to be by said treasurer paid to the state treasurer for the benefit of the school fund.

Note that the name and location of the factory is demanded; also that it is not mandatory to brand any but full cream cheese, or cheese made from milk which contains at least 3 per cent. of butter fat. A number of factory men have endeavored to take advantage of this law and take off part of the cream and manufacture into butter while the partially skimmed milk is made into cheese and branded full cream. This is a dangerous process for a manufacturer, as his judgment as well as his conscience is perverted by his greed of gain, and unless he keeps close rein upon himself he will skim the milk too deep, thus making himself amenable to the law, and by placing goods upon the market that are just within the pale of the statute or slightly below, work injury to our reputation for standard cheese.

It may be said that the trier determines the quality and price cheese will bring in the market, but it must not be forgotten that the poorer the quality the fewer the triers. Thirty-five per cent. of the milk tested in the state of Minnesota in 1887 was below grade; 2½ per cent. of the milk tested in the same districts in 1889 was below grade. In 1887 sales of foreign cheese in the city of Minneapolis was 727,000 pounds; state cheese, 582,000 pounds. In 1889 the sales were in the same city, foreign cheese, 394,000 pounds; state cheese, 1,456,000 pounds. The application can be made to the cheese industry of our state with significance.

A large number of factory men have urged the necessity of a state brand for cheese.

Manufacturers are united that something be devised for a brand that could not be scraped off by unscrupulous commission merchants in Chicago and other large markets. The matter has been given considerable study, and several experiments have been made. It has been found that a stamp that impresses the cheese is impracticable because it makes a rough surface which is undesirable in cheese that is to be shipped or stored for a length of time. The only plan that seems to answer is to place the stencil on the bandage when the cheese is ready for shipment. The lettering cannot be removed without tearing the bandage. If this plan is followed the package is marked as follows, according to the law now in force:

BIG HOLLOW FACTORY,
SPRING GREEN, WIS.

The cheese itself would bear the following:

WISCONSIN STANDARD
FULL CREAM CHEESE.
FACTORY NO. 392.

The name, location and number of the factory should be kept on record in this office, the stencils to be furnished by the commissioner and a penalty fixed for selling without using the brand or for using any number not properly recorded. This plan has met with success in New York where a reputation for cheese making has been secured second to no state in the Union.

Communications have been received from manufacturers, as well as some honest commission men, that dealers had no scruples about scraping off a brand and substituting one that misrepresented the contents. A careful investigation of the law disclosed that the section referring to labels applies to manufacturers and compounders and not to dealers. This places the factory men at the mercy of unscrupulous merchants who stand ready to barter their honesty for an additional penny per pound. That this defect in the the law should be remedied is obvious.

During the summer last past it came to the knowledge of this office that Church & Braunling, a Chicago firm, running a cheese factory in Manitowoc county, were making a large amount of butter and at the same time making cheese which they were branding as "full cream." A shipment of fifty boxes was found in the warehouse of the Goodrich Transit company, and samples taken. Action was brought by Church & Braunling against the commissioner and assistant for damages, on the ground that the officers had no authority, under the law, to enter the premises of a common carrier to take samples of suspicious goods, and upon the ground that the firm of Church & Braunling were manufacturing cheese in Wisconsin for their own use in Illinois, and that the cheese was consigned to themselves. The court held that the officers had exceeded their authority and rendered a verdict accordingly of six cents damages. The commisioner, having no desire to make the county and state additional expense, paid the costs. The decision of this case, however, has no bearing upon the one that is pending, of the State vs. Church & Braunling for selling "skim cheese" for "full cream." If a firm from the state of Illinois can come to Wisconsin and follow a business that residents and tax payers cannot engage in because of laws that were framed to protect an important industry, the dairymen of the state ought to know it that more stringent laws can be formulated. The practice of filling cheese with lard and poor butter and the manufacture of oleo-butter in the state of Illinois, explains in a very significant way why factories are standing idle and going to decay in that state, and why cheese-makers who have made spurious goods until the public found that it was being imposed upon, come to Wisconsin and knock at honest doors and ply their infamous trade to the ruin of our markets at home and abroad.

OLEOMARGARINE.

Four or five million pounds of oleomargarine are used annually in Wisconsin. This means the product of 30,000 cows. It means that 6,000 farms are deprived of profit and fertility that would naturally come from 30,000 cows. It means that 30,000 heifers remain unborn or are killed at birth. It means over a million dollars handled by manufacturers, outside the state instead of farmers within our state who help bear the burden of taxation. No man can live in a business sense and place his butter in competition with tallow and cotton seed oil so manipulated that it requires an expert chemist to detect the difference between the compound and dairy butter. It is not clear that we should prohibit the manufacture of any mixture that is not injurious to health, but we should strip oleomargarine of its power, and that can only be done by obliging manufacturers to make it look like itself and not like butter. Butter has worked all these years to make for itself a market and a demand. Now that they are established it should not be robbed by an imitation. The attack has but just begun. No corner of the state is too remote for its presence. No table so humble, no dining room so grand, no lumber camp so rough, that oleomargarine, with its mellow name, will not walk upon and into, with a deceitful bow and brazen smile, with the claim that is name is butter.

Sixty thousand cows graze upon Wisconsin pastures. Eighteen million dollars are invested in them by Wisconsin herdsmen. Are we to allow a Chicago corporation to drive our flocks from the fields and force men into business they are not fitted to by birth or training? It is not justice. It is against all ideas of right. The day is near at hand when public sentiment will demand recognition. No man or company of men have the right to stand in the light of a great and common interest. Shall the people and legislature of Wisconsin show themselves more friendly to a Chicago fraud than they are to a Wisconsin industry? The legislature of 1889 said "No." The honest consumer says "No." We need more perfect laws on this question, and I believe the sentiment of the state will be found solidly in favor of their enactment. During the winter of 1889 the names of all the wholesale and retail dealers of oleomargarine in the state were secured, and a personal inspection of the premises was made to determine if the law was being complied with. Nearly every dealer was complying with the United States revenue law, but some were found who were not with the state law. The following section explains the offense and prescribes the penalty. The amount of fine is left discretionary with the court, and it has been five dollars in each and every case.

Chapter 185, laws of 1887:

> SECTION 1. Any person who shall knowingly make, traffic and sell oleo-butter, butterine or any other imitation of butter or cheese, or who shall knowingly keep upon his table in any hotel, restaurant or boarding house, any imitation butter, shall make the same fully known to the buyer, by posting up notices of the fact at, and in the place where such articles are for sale or for consumption.
>
> SECTION 2. Any person who shall omit posting up such notice, shall be punished by imprisonment in the county jail, not more than thirty days, or by a fine not to exceed twenty-five dollars.

Warrants were issued for the arrest of F. W. Muller, of Milwaukee; W. C. Noall, of Commonwealth; R. J. Kneebone, of Florence; Armour Packing Co., W. H. Mackmiller, of Ashland, and F. A. Day, of Hurley. F. A. Day and the Armour Packing Co., were acquitted, and the others were found guilty and fined.

In 1888 there were 55 dealers in Wisconsin in oleo-butter. In 1889 there were 88 dealers. Reports from merchants throughout the state show that sales have decreased quite rapidly during the past year. Letters are on file in the office from a number of dealers, stating they will not take out a license another year. The government may realize a small revenue from the sale of oleo-butter in the states, but it must be remembered that while the government gets two cents for each pound of oleomargarine sold, a pound of butter is displaced which a farmer would have secured a profit upon. The dairymen of Wisconsin cannot do business upon this basis. To produce a pound of butter, costs at least thirteen cents. Oleomargarine can be placed upon our markets at a good profit, for twelve cents, after the dealer has paid his revenue of two cents per pound.

In counties like Green, Sheboygan, Manitowoc, Richland, Jefferson and Monroe, where grass and climate are especially adapted to dairying and where both skill and capital are devoted to this industry, this nefarious competition threatens disaster.

Immediately after the supreme court decision upon the original package question, a large petition was sent to Senator Spooner, urging the members and senators to support the Hiscock bill, which gave to the states the right to control the manufacture and sale of oleomargarine.

The text of the Hiscox bill is as follows:

"A BILL SUBJECTING OLEOMARGARINE TO THE PROVISIONS OF THE LAWS OF THE SEVERAL STATES:

"*Be it enacted by the Senate and House of Representatives of the United States of America, in Congress Assembled;* That no state shall be held to be limited or restrained in its power to prohibit, regulate, control, or tax the sale, keeping for sale, or the transportation, as an article of commerce or otherwise, to be delivered within its own limits, of oleomargarine, as defined by section 2, chapter 840, of the laws of the forty-ninth congress, by reason of the fact that the same has been imported into such state from beyond its limits, whether there shall or shall not have been paid thereon any tax, duty, import, or excise to the United States."

The leading dairy states throughout the Union were very active in supporting this measure. Upon the receipt of the petition by Senator Spooner, the following letter was sent to this office:

WASHINGTON, D. C., July 25, 1890.

HON. H. C. THOM,
Dairy and Food Commissioner, Madison, Wis.:

DEAR SIR — I have your favor of the 23d inst., with petitions. They will be presented in the senate to-morrow and properly referred. The house, has, as you know, passed a pretty broad bill. It will manifestly be necessary to change it somewhat in conference, but we will endeavor to see that it is not so changed as to affect the interest which you represent.

Yours very truly,

JOHN C. SPOONER.

July 26. "The petition was presented in the senate to-day."

The disposition of the Hiscock bill is fully explained by the following correspondence which took place between Gov. Hoard and Senator Spooner:

UNITED STATES SENATE,
WASHINGTON, D. C., Sept. 22, 1890.

HON. W. D. HOARD:

My Dear Governor — I have your favor of the 20th inst., relative to the original package bill. The slip which you enclose is partly right and partly wrong. The original package bill was introduced in the senate and passed the senate in the following form: "That all fermented, distilled, or other intoxicating liquors or liquids transported into any state or territory or remaining therein for use, consumption, sale or storage therein, shall upon arrival in such state or territory be subject to the operation and effect of the laws of such state or territory enacted in the exercise of its police powers, to the same extent and in the same manner as though such liquids or liquors had been produced in such state or territory, and shall not be exempt therefrom by reason of being introduced therein in original packages or otherwise." You will observe it applied only to original packages of fermented, distilled or other intoxicating liquors or liquids. It was amended in the house of representatives, and passed that body in the following form: "That whenever any article of commerce is imported into any state from any other state, territory or foreign nation, and there held or offered for sale, the same shall then be subject to the laws of such state. Provided, that no discrimination shall be made by any state in favor of its citizens against those of other states or territories in respect to the sale of any articles of commerce, nor in favor of its own products against those of like character produced in other states or territories; nor shall the transportation of commerce through any state be obstructed except in the necessary enforcement of the health laws of such state."

I had prepared, with several others, to make a contest in the senate to concur in the house amendment, supposing it would be in proper form to be enacted into law, made so general as to include oleomargarine and other articles prohibited by the states. When we came to examine it, we found that the house had changed it so that it applied only to articles imported into any state from any other state, territory or foreign nation, not precluding the importation into territories, and omitting from the list of places of export the District of Columbia, which is neither a state, territory or foreign nation. So that under the bill, as amended, any article might be shipped into any state or territory from the District of Columbia It was necessary, in the opinion of nearly all of the senators, that the bill should be perfected, which, of course, could only be done by disagreeing with the house amendment and throwing it into conference. This was done. The conference committee of both houses agreed upon the bill as it had passed the senate. It was presented, according to the rule, first to the house of representatives, and, that body having agreed to it, and receded from its amendment, no further action was required or could be had by the senate upon it, and the matter was beyond reach or amendment in the senate. If the house amendment had been so drafted that the senate could concur in it, I have no doubt that we could have made successfully the oleomargarine fight in the senate. The Hiscock bill embracing oleomargarine is pending, and I do not doubt will be favorably reported and passed early in the coming session. I return herewith attached the clipping. With best wishes for you in every way,

Your friend,

JOHN C. SPOONER.

We will be obliged to wait until the next session of congress, at least, before the states can take measures to protect themselves. Oleomargarine is a fraud. It would not be tolerated a day by the public if every one who eats it could know. Ninety-nine out of every hundred pounds of oleo-butter that is consumed is so consumed under the supposition that it is honest butter. The dealer buys it of the manufacturer for what it is, and he sells it to the boarding-house keeper or the hotel keeper for what it is, but the people who eat it at the table, invariably suppose it to be honest butter. Here slips in the element of fraud that makes profitable the whole transaction.

VINEGAR.

Over one hundred samples of vinegar have been tested, and but a small percentage have been found as represented by the label. Manufacturers, as a rule, seem to have no scruples about branding as pure cider vinger the cheapest kinds of distilled vinegars. Honest vinegar makers hailed with delight a movement to give them a fair chance to place their goods upon the market and not have them come in competition with a cheap grade, so colored that they could not be told from the genuine. It is much to be regretted that difficulty with the law was encountered, but it was inevitable, and the sooner it could be brought before the supreme court the shorter the time that honest manufacturers would have to wait for fair judgment at the hands of the law.

Retail dealers are advised to require wholesalers to furnish a written guarantee that the vinegar they furnish shall correspond in every particular with the label which accompanies every invoice.

In the event of fraudulent goods being imposed upon the retailer, and prosecution ensues, the guarantee of the wholesaler insures redress for the retail dealer.

Some manufacturers of vinegar, whose works are outside the state, label their barrels with a brand as follows: "Extra Quality," "Standard Quality," "XXX," or something of that kind. The agent who represents a firm within the state makes the claim, and often goes to the trouble to write out a guarantee, that the vinegar is pure cider vinegar. Upon analysis, these goods have been found, without a single exception, to be cheap whisky vinegars, colored so as to imitate the genuine article. The manufacturers thus escape the damaging evidence of a false brand, and trust that good fortune will deliver them from being found out, by the discovery of misrepresentations by their agent. If the dealer refuses to pay for the goods, after proper analysis, the agent has not received money under false pretenses, and action does not lie against him personally. It is suggested that a law be enacted that will hold an agent for misrepresentation.

Reports have been received and evidence offered, that there are thousands of barrels of good cider vinegar in cellars waiting for a market. The barrel vinegar makers claim that they are unable to make apple or fruit vinegar for the price at which whiskey vinegars are retailed. There are plenty of people who stand ready to buy, it if they could be assured that they were paying money for the genuine article. Now that a decision has been rendered by the supreme court the trade will soon understand that the selling of vinegar, or any other food product, under a false label will not be tolerated.

DRUGS.

Section 3 of the statute defining the duties of dairy and food commissioner specifies that "it shall be the duty of the commissioner to enforce all laws that now exist, or that may hereafter be enacted in this state, regarding the production, manufacture or sale of dairy products or *the adulteration of any article of food or drink or of any drug;* and personally, or by his assistants, to inspect any article of milk, butter, cheese, lard, syrup, coffee or tea, *or other article of food or drink or drug,* made or offered for sale within this state, which he may suspect or have reason to believe to be impure, unhealthful, adulterated or counterfeit," etc.

If some consideration be given to the scope of the above requirements, it will be seen that the enumerated articles of food, drink or drugs, may include a large proportion of the articles in daily use, all of which are alike subject to adulteration, or liable from various causes to be unhealthful, impure or deficient in those characters which they are represented and assumed to possess. Careful and unprejudiced observers, such, for example, as the chemists in the United States department of agriculture, who have undertaken for official purposes to gather information respecting the extent and character of food and drugs adulterations, have, indeed, shown that from the cheapest and most simple article of diet to the most expensive, the art of the manipulator has been applied.

It is also sufficiently evident that among the articles belonging to these different classes, none should possess a higher degree of purity than the numerous drugs and medicinal preparations employed in the treatment of disease, for upon these depend in so large a measure the conservation of the public health, and all the benefits and blessings which this includes. The excellent pharmacy laws of the state have exerted in this connection a most beneficial influence by elevating the standard of pharmaceutical skill and requirements, and by incidentally directing attention to the supreme importance of excluding from medicinal use all drugs, chemicals or medicinal preparations which do not conform to the proper and recognized standards of strength and purity. For several years the Wisconsin Pharmaceutical association has likewise made the commendable effort, through the appointment of a committee on adulterations, to exercise the requisite control over the purity of drugs, but it is not to be expected that such a committee should undertake to perform gratuitously so extended and important a public service as is thereby involved, nor has it been found possible with the limited time and opportunities of such a committee, composed of practical pharmacists, to adequately accomplish the purpose in view.

The work of the Dairy and Food commission, as elsewhere explained, has thus far been necessarily limited to the duties of inspecting important dairy products and such other articles of food as seemed to require more immediate examination. It is apparent, however, that it is not only wise and expedient, but eminently desirable, that the commission should seek at the earliest opportunity to extend its usefulness to the broadest attainable limits, and thus to truly accomplish the mission for which it was designed.

In order that this purpose may be realized, and that proper attention should be given to the inspection and examination of important drugs, as well as to a large number of products classed as food and drink, the services of an additional assistant are required. The duties and functions of such an assistant would demand, moreover, that he should be not only a thorough chemist, but also an acknowledged expert in the examination and analysis of drugs and products of pharmaceutical art, as well as in branches involving microscopical research and skill.

It is believed that with suitable and necessary provisions the excellent facilities of the Department of Pharmacy, of the University of Wisconsin, might be further utilized in the directions indicated, and by the appointment of a competent assistant, who should be permanently associated with the School of Pharmacy, a co-operation of closely allied interests would be effected, which would be of widely recognized value in the extent and character of the service rendered to the state. For the accomplishment of this extension of the service of the commission, it is estimated that an increase of $2,000 should be made to its annual appropriation, at least $1,000 of which should constitute the salary of the expert assistant to be employed, and the remainder to constitute a fund for meeting such contingent expenses as the increased duties of the office may involve.

The recommendations thus embodied, which have already received the approval of the President of the University, as well as the director of the School of Pharmacy and the Wisconsin Pharmaceutical association, are therefore submitted with the confidence of their receiving also your favorable consideration.

LEGISLATION.

But few laws have been passed by states defining the powers and duties of officers regarding adulteration. The state of New York took the initiative in this matter and for six years effective work has been done in that state. At the outset the duties of the commissioner related only to dairy products, but from time to time the scope of requirements has been extended and food standards are being established. When the legislature of Wisconsin passed a law creating the Dairy and Food commission there were but few laws at hand from which food standards could be obtained and no data which were specific enough to determine what articles of food required attention. The work of this department has been devoted almost exclusively to gathering samples of foods and testing them in order to gather facts so that when the next legislature convenes we would be in a position to place before the members an intelligent statement of the frauds that are perpetrated upon the public and remedies to eradicate the evils. The court of appeals of New York says: "It is notorious that the adulteration of food products has grown to proportions so enormous as to menace the health and safety of the people. Ingenuity keeps pace with greed, and the careless and heedless consumers are exposed to increasing perils. To redress such evils is a plain duty but a difficult task. Experience has taught the lesson that repressive measures which depend for their efficiency upon proof of the dealer's knowledge and of his intent to deceive and defraud are of little use and rarely accomplish their purpose. Such an emergency may justify legislation which throws upon the seller the entire responsibility of the purity and soundness of what he sells and compels him to know and to be certain."

With considerable trouble all the laws upon adulteration have been gathered from Europe and America. The department feels confident that, with the aid of the experience that other countries and states have had, coupled with the data which have been secured by work in the laboratory, laws can be framed which will cover all exigencies which exist in our state, in a satisfactory manner.

There is no more important subject before the thinking public to-day than the condition of our food supply. Dr. Beckwith, of the Ohio state board of health, says: "No subject in the last decade, relating to the human economy, has received greater consideration or elicited fuller discussion than the contamination of food through the agency of adulteration."

"The wonderful revelations of science have made possible not only the wholesale sophistication of most of our food products, but have provided a way, in numerous cases, for the actual substitution of fraudulent, if not pernicious substances for many others.

"To such an enormous extent has sophistication been carried within the past few years, that legislative action in nearly all civilized countries of the world has been taken, with a view of alleviating, if not relieving, the sufferings of protesting humanity."

The wisdom of legislation is well illustrated in the dominion of Canada. The work of examination began in 1876, when 51.66 per cent. of the articles examined were found adulterated. In 1882 this percentage had been reduced to 25.

Secretary Rusk said in his address at the Ohio state fair: "More than one-half of the income of the average wageearners of the human race is spent for food. The special sphere of the agricultural department is to enlarge the facilities for providing food. Let it also be the special sphere of the department to see that the food supplied be pure and wholesome. Every product must be sold for what it is. The adulteration of foods is injurious to public morals. It tends to lower the price of the legitimate product, and hence injure the farmer. I am unalterably opposed to any deception in the naming of any article which uses the prestage of the farm to cover up the fraud of the manufacturer. We must increase and extend our foreign markets by every legitimate means in our power, by surrounding the manufacture of our various food products with such stringent regulations that the word 'American' or the brand 'U. S.' on any food product will be recognized the world over as synonymous with the words 'pure' and 'wholesome.'"

In conclusion, I tender my thanks to the press, in the state and out of it, for the aid it has rendered in establishing the purpose of the commission in the understanding of the people. I am also grateful to the district attorneys for their efficient service, and to the merchants and manufacturers for their co-operation.

I am, sir, your obedient servant,

H. C. THOM,
Commissioner.

REPORT OF THE STATE CHEMIST.

MADISON, Wis., Sept. 30, 1890.

HON. H. C. THOM,
State Dairy and Food Commissioner:

SIR: — I have the honor to submit the following report for the year ending September 30, 1890:

MILK.

Milk, like all products of the animal body, is of very complex composition. To the ancient as well as the modern world it was a fluid of great virtue, and was the first form of food that received the attention of physicians and experimenters. To it was ascribed valuable medicinal qualities. Hippocrates, the celebrated physician, prescribed milk, either that of the cow, ewe, or the goat, in certain ailments, but forbade its use in cases of headache, fever and bilious attacks. Aristotle decided that "milk is elaborated not decomposed blood." Avicenna and Placitus devote many pages to the subject, and gravely discuss whether milk was hot, cold or moist; concluding that animal milk, compared with that of human, is cold; human with that of animal, hot. Only three parts were at first recognized in milk, viz.: Serum, butter and curd. Bartoletus, in 1619, was the first to mention a fourth constituent, milk sugar. In his day, sulphur, mercury, and a saline principle were considered as the three active essences of all things; hence, from the yellow color of the butter, Bartoletus referred it to a sulphur principle, the whey to quick silver, and the curd to a saline element. He also compares milk with blood. In the eighteenth century Leeuwenhoek first observed milk under the miscroscope. He saw that it was a fluid containing many globules. Some, which he judged to be of a buttery nature, rose to the surface, others sank to the bottom and were evidently of a different composition. Boerhaave made a careful study of the properties of milk both in health and in disease. He saw in it the most perfect food, and to him it was a fluid containing all the elements of the body; hence, he devoted much time and attention to its study. He tested milk with a great variety of reagents, and found that it was curdled by all acids. On boiling with alkalies he noticed the yellow color caused by the decomposition of the milk sugar. The first quantitative analysis of milk was made by Geoffroy in 1737. He gave the per cent. of milk, sugar and salts in the serum as 5.2 per cent., a determination almost as exact as that of the present time. He distilled the whey, and in the residue recognized common salt by the crystals.

As early as 1756, milk sugar was an article of commerce. Creuzius, a Swiss chemist, prepared an excellent quality of this substance, but his process was a secret and died with him. Sheele discovered lactic acid, and found phosphate of lime to be always present in casein. Hoffman determined the total solids of milk to be 13.5 per cent.

Composition of Milk.— Up to the present time the milk of the mammalia alone has been fully analyzed. It has been found to consist of water, sugar and a number of albuminoid bodies, fat and a small quantity of saline matter. These bodies are partly in suspension and partly in solution; sugar of milk, casein, peptones, lactochrome and saline matter are in solution. A portion of the casein is in the form of fine granules, while the milk fat is in the form of an emulsion. When a thin layer of milk is examined under the microscope the only thing visible is the milk fat which appears in the form of innumerable globules, their number depending on the richness of the sample; good milk containing from two to three and a half millions of globules in every cubic millimeter. Besides the constituents above given, milk, according to Blyth, contains the following:

Parts by Weight.

Milk fat	Olein	1.477	3.50
	Stearin .. Palmatin	1.750	
	Butyrin	.027	
	Caproin Caprylin Rutin ..	.003	
Casein			3.98
Albumen			.77
Milk sugar			4.00
Galactin			.17
Amorphous bitter principle			.001
Lactic acid Alcohol Odorous principle Urea Kreatinine			Traces
Ash	$K_2 O$	0.1228	0.70
	$Na_2 O$	0.868	
	$Ca O$	0.1608	
	$Fe_2 \cdot O_3$	0.0005	
	$P_2 O_5$	0.1922	
	Cl	0.1146	
	$Mg O$	0.243	
Fluorine			Traces.
Sulphuric acid in combination			0.005
Sulphocyanates			Traces.
Water			86.67

Pure milk fat at ordinary temperature is a solid, with an agreeable taste and smell. Its specific gravity is .91200-.91400 at 100° F., melting to a clear yellow fluid at 96° F. The yellow color is due to the presence of lactochrome; but by the use of suitable solvents the fat may be obtained almost colorless. Milk fat is an intimate mixture of the glycerides of the fatty acids, palmitic, stearic and oleic, insoluble in water; and also of the glycerides of certain fatty acids, soluble in water, viz., butyric, caproic, caprylic and capric acids.

Albuminoids of Milk.— The principle albuminoids of milk are, casein, albumin and nucleine; to these may be added fibrine. Casein is the most important constituent of the albuminoids. It is precipitated from its solution by a variety of substances, mineral acids, lead acetate, cupric sulphate, alum, mercuric chloride, rennet, etc. The best precipitant is sulphate of magnesia, which leaves the nucleine in solution.

Pure casein is a white, brittle, transparent substance, insoluble in water, but soluble in dilute alkalies. The amount of casein remains nearly constant, being about 4 per cent. Serum albumen, as found in milk, in no way differs from the albumen of the blood. Separated from milk in the ordinary way, it is in yellowish flakes, brittle, without taste or smell, insoluble in water, alcohol and ether; soluble in dilute caustic alkali, if gently warmed. The amount of albumen in milk is about 0.7 per cent. Directly after calving it may rise as high as 10, but in a few days the milk becomes normal and the albumen sinks to 0.7. Nucleine is distinguished from the other albuminoids by containing phosphorus. Fibrin is also present in milk, though in minute quantities. The experiments of Babcock would indicate that although the quantity present is not more than two or three ten thousandths, yet it may exercise a decided influence on the creaming of milk.

Milk sugar with two exceptions is found only in the milk of the herbivora. It is soluble in six parts of cold water and 2.5 parts of boiling water; it is insoluble in absolute alcohol and in perfectly dry ether. Its watery solution is neutral and has a sweet taste. It undergoes lactic fermentation readily but alcholic with difficulty.

The ash of milk has about the following composition:

	Per cent.
Potash	24.67
Soda	9.70
Lime	22.00
Magnesia	3.05
Ferric oxide	.53
Phosphoric acid	28.45
Sulphuric acid	.30
Chlorine	14.28

The mineral constituents of cow's milk are therefore phosphate of potash, phosphate of lime and magnesia, common salt and a trace of phosphate of iron. The albuminoids, ash and milk sugar in aqueous solution form what is known as a milk serum. Milk serum is a viscous liquid, extremely well adapted for emulsifying fat. When the proportion of solids is high, its viscosity is sufficient to retard creaming and the yield of the churn. The composition of the serum is very constant for the same cow, and does not vary much in different animals. The limit of solids is from 8.5 to 11. per cent. Jersey and Guernsey milk contains the highest and Holstein milk the lowest per cent. of serum solids. The solids of the serum increase slightly with the period of lactation, the amount being about .04 per cent per month.

Lactochrome is a bright red orange, resin like mass, softening at 100 °F., freely soluble in water. There is but little doubt that lactochrome is the cause of the yellow color of milk whey and also the coloring matter of butter.

Specific Gravity.— As the result of numerous experiments, it has been found that the specific gravity of milk is from 1.029 to 1.036; 1.029 being the lowest limit for pure milk.

Testing Milk.— The rapid determination of the quality of the milk is of great importance and various methods and instruments have been invented for this purpose. The most familiar of these instruments is the lactometer. This instrument is a form of the hydrometer, an instrument designed to measure the specific gravity of liquids. The scale of the lactometer covers the specific gravities ranging from 1.000 (water) to 1.0348. The instruments are usually adjusted at 60° F., and a correction requires to be made for temperature to the extent of nearly one degree in specific gravity for every ten degrees of temperature above or below 60° F. Thus if milk had an apparent specific gravity of 1.030 at 70° F., the corrected gravity at the standard temperature would be 1.031. As fat is lighter than water the removal of cream would tend to raise the specific gravity of the milk, and the presence of a large quantity of fat tend to lower it. A low gravity, therefore, may indicate a milk rich in fat or one to which water has been added. It is evident, therefore, that the lactometer can only indicate a deviation from normal milk and a determination of the fat is necessary. For this purpose a number of instruments have been prepared. The simplest of these is known as Feser's Lactoscope. This instrument in its operation depends on the fact that under ordinary condition the richer the milk in fat the greater is the number of fat globules in a given space, and hence a greater opacity. The instrument consists of a small glass cylinder, in the lower part of which is a small rod of white glass ruled with a few black lines. Upon the outer cylinder is a scale indicating the percentage of fat. Four cubic centimeters of milk are put into the cylinder and water is added until the black lines on the white glass rod can just be distinguished. The level of the water as shown upon the scale upon the large cylinder gives the per cent. of fat. The ease and quickness with which milk can be tested with this instrument has caused it to be extensively used; but little reliance should be placed on it unless its accuracy has been compared with the regular gravimetric analysis. The instrument as found in the market is anything but accurate; instruments some times varying over a per cent. on the same milk. As regards the principle of the process, Dr. Veith says: "The opacity of milk does not solely depend upon the presence of fat globules, the serum in which the latter are floating being itself opaque and most probably varying in degree in different samples of milk. Moreover, it is not the percentage quantity of fat globules in which the fat is subdivided. It is an established fact that the fat globules in milk so far from being all of uniform size, vary considerably, and that the different sizes are present in rather variable proportions in different samples of milk."

It is evident from the above that the lactoscope, like the lactometer, only gives us an indication of the quality of the milk, and that to obtain an accurate knowledge of the value of the milk more exact instruments and methods must be employed. This must be done either by the regular gravimetric process, or if the fat alone is to be tested by one of the numerous volumetric methods which have been published in the last two years. The most promising of these methods for accuracy, quickness and ease of manipulation is that recently published by Dr. S. M. Babcock in Bulletin No. 24 of the Wisconsin Agricultural Experiment Station. The following is a description of the test as given in the bulletin.

DESCRIPTION OF APPARATUS AND CHEMICALS REQUIRED.

1. *Test Bottles.* (*Fig.* 1.) These are of the same form as the bottles used in Short's test, but are made a little smaller and of heavier glass. They should contain up to the neck not less than 40 c. c., and not more than 45 c. c. Each division of the graduated scale upon the neck represents .04 c. c., and in order to facilitate the reading the neck is made of such a diameter that the marks of the scale are about 1½ millimeters apart. Five of these divisions are equivalent to one per cent. of fat when 18 gms. of milk are used in the test, it being assumed that the specific gravity of the butter fat, at the temperature at which the reading is made (about 120° F.), is 0.9.

2. *Pipette forMeasuring Milk.* This may be of any form, but that shown in fig. 2, with a rather wide opening at the lower end to allow the milk to run out rapidly is to be preferred. It should contain when filled to the mark, 17.6 c. c. A pipette of this size will deliver a little less than 17.5 c. c. of milk. The quantity of milk required for the test sample of 18 gms. is 17.44 c. c., if the milk has the average specific gravity of 1.032.

3. *A Measure for the Acid.* A graduate or cylinder of glass (Fig. 3), with a lip to pour from and a single mark at 17.5 c. c., is the best form for general use. In laboratories a large burette, holding 100 c. c. or 200 c. c. with marks at each 17.5 c. c. and having a glass stop-cock, may be used to advantage, but on account of the liability of breakage is not to be recommended in factories or private dairies.

4. *A Centrifugal Machine.* Figs. 4 and 5 show the construction of the machine used by us. The gear in this apparatus is so proportioned that the wheel which carries the test bottles makes about ten revolutions to one of the crank; with this it is easy to impart from 700 to 800 revolutions per minute to the horizontal wheel. Any arrangement that will do this, either by belt or gear, will answer the purpose. Within the horizontal wheel (a, Fig. 5) are placed sectors (b) made from heavy sheet copper to which are soldered cups or tubes (c), inclined so as to make an angle of about thirty

degrees with the horizontal, for the support of the test bottles. The horizontal wheel is surrounded by a copper jacket (d, Fig. 5) with a cover. This serves the double purpose of supplying heat for the test by pouring hot water into it, or by heating water directly with a lamp placed beneath, and of arresting the hot acid which would fly off if a bottle should break.

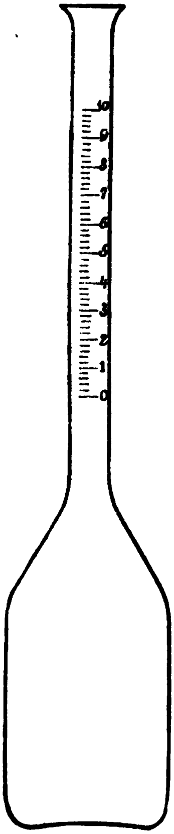


Fig. 1.

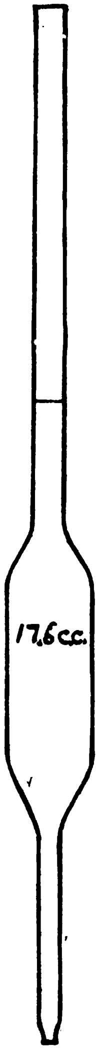


Fig. 2.

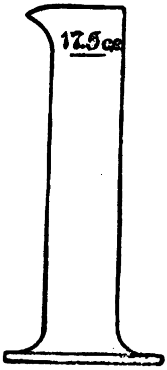
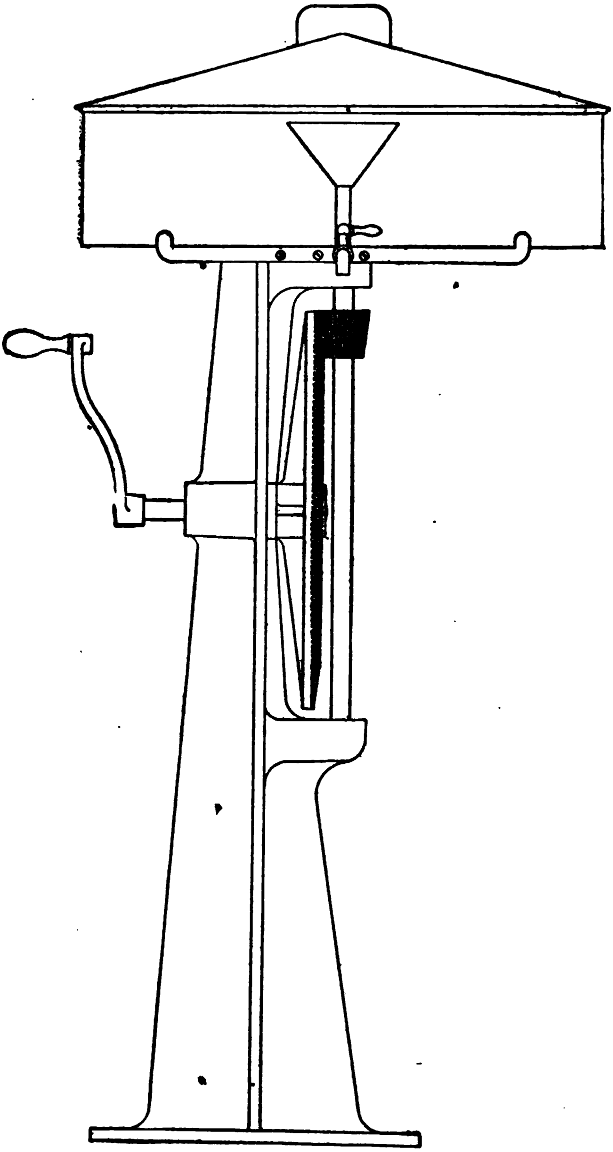


Fig. 3.



Fig

5. *A kerosene or gas lamp* for heating two or three quarts of water to boiling.

6. *Commercial Sulphuric Acid*, having a specific gravity of 1.82 or about 90 per cent. pure. If only the pure acid is available, it should be diluted with water to the strength indicated.

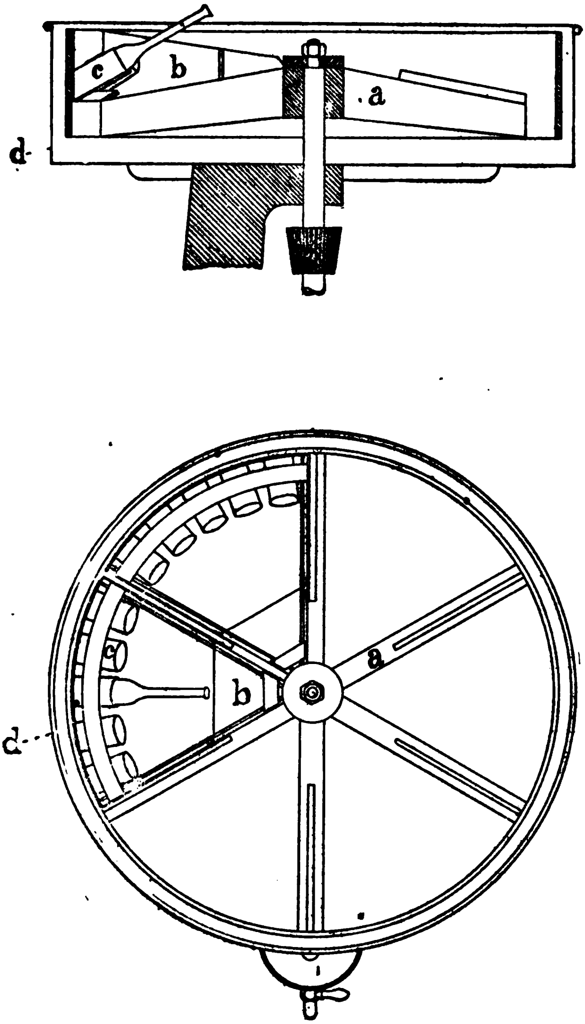


Fig. 5.

MAKING THE TEST.

Sampling the Milk. Every precaution should be taken to have the sample represent as nearly as possible the whole lot of milk from which it is taken. Milk fresh from the cow, while still warm, and before the cream has separated in a layer, may be thoroughly mixed by pouring three or four times from one vessel to another. Samples taken at once from milk mixed in this way are the most satisfactory of any. Milk that has stood until a layer of cream has formed should be poured more times, until the cream is thoroughly broken up and the whole appears homogeneous. No clots of cream should appear upon the surface when the milk is left quiet for a moment. With proper care any milk that has not coagulated or that has not been exposed to the air until the surface of the cream has become dried, may be mixed so that a representative sample may be taken. Milk should not be poured more times than is necessary, as continual mixing in this way is liable to churn the cream, forming little granules of butter that quickly rise to the surface. When this occurs it is impossible to obtain a fair sample. Milk is sometimes churned by being transported long distances in vessels that are not full. When this occurs it is useless to make an examination.

It is impracticable to sample a large amount of sour milk, but a small sample of a pint to a quart may be thoroughly mixed by adding five per cent. of strong ammonia water which will dissolve the curd and permit a uniform mixture being made. When ammonia is added the final results should be increased by five per cent. Samples from sour milk are, however, never as satisfactory as those taken when the milk is in a proper condition.

Measuring the Milk. When the milk has been sufficiently mixed, the milk pipette is filled by placing its lower end in the milk and sucking at the upper end until the milk rises above the mark on the stem; then remove the pipette from the mouth and quickly close the tube at the upper end by firmly pressing the end of the index finger upon it to prevent access of air; so long as this is done the milk cannot flow from the pipette. Holding the pipette in a perpendicular position, with the mark on a level with the eye, carefully relieve the pressure on the finger so as to admit air slowly to the space above the milk. When the upper surface of the milk coincides with the mark upon the stem, the pressure should be renewed to stop the flow of milk. Next, place the point of the pipette in the mouth of one of the test bottles, held in a slightly inclined position so that the milk will flow down the side of the tube leaving a space for the air to escape without clogging the neck, and remove the finger allowing the milk to flow into the bottle. After waiting a short time for the pipette to drain, blow into the upper end to expel the milk held by capillary attraction in the point. If the pipette is not dry when used, it should be filled with the milk to be tested, and this thrown away before taking the test sample. If several samples of the same milk are taken for comparison, the milk should be poured once from one vessel to another after each sample is measured. Neglect of this precaution may make a perceptible difference in the results, through the separation of cream, especially when the milk examined is rich.

Persons who have had no experience in the use of a pipette will do well to practice a short time by measuring water into a test bottle before attempting to make an analysis. The manipulation is easily acquired, and with a little practice milk may be measured nearly as rapidly with a pipette as with a graduate, and with much greater accuracy.

Adding the Acid.—When the milk has been measured into the test bottles the necessary amount of sulphuric acid may be added immediately, or the bottles may be left for a day or two without materially changing the results; samples that have remained in the test bottles more than a week have given the same amount of fat as samples tested immediately after being measured. If the milk has become coagulated, the curd should be broken up by shaking the test bottle before the acid is added.

The volume of commercial sulphuric acid required for a test is approximately the same as that of the milk, 17.5 c. c. for the ordinary test. If too little acid is added, the casein is not all held in solution throughout the test, and an imperfect separation of the fat results. If too much acid is used, the fat itself is attacked. The acid need not be measured with great accuracy, any quantity between 17 c. c. and 18 c. c. will answer the purpose.

Great care must be taken in handling the acid to avoid getting any of it upon the skin or clothing, as it is very corrosive. If by accident any is spilled upon the hands or clothes, it should be washed off immediately, using plenty of water. A prompt application of ammonia water to clothing upon which acid is spilled may prevent the destruction of the fabric, and restore the color.

When all of the samples of milk to be tested are measured ready for the test, the acid measure is filled to the 17.5 c. c. mark with sulphuric acid, and from this it is carefully poured into a test bottle, containing milk, that is held in a slightly inclined position for reasons given in directions for measuring the milk. The acid being much heavier than milk sinks directly to the bottom of the test bottle without mixing with the milk that floats upon it. The acid and milk should be thoroughly mixed together by gently shaking with a rotary motion. At first there is a precipitation of curd from the milk, but this rapidly dissolves. There is a large amount of heat evolved by the chemical action, and the solution, at first nearly colorless, soon changes to a very dark brown, owing to the charring of the milk sugar and perhaps some other constituents of the milk.

Upon standing a short time the fat begins to collect upon the surface, not in a clear layer, but having at first, the appearance of a dirty cream. The separation of fat by gravity alone is not complete even when the bottles are left standing for several hours; with the centrifuge, however, a perfect separation is accomplished in a few minutes.

Whirling the Bottles. The test bottles containing the mixture of milk and acid may be placed in the machine directly after the acid is added, or they may stand several hours without harm. An even number of bottles should be whirled at the same time, and they should be placed in the wheel in pairs opposite to each other, so that the equilibrium of the apparatus will not be disturbed. When all of the test bottles are placed in the apparatus, the cover is placed upon the copper jacket, and the machine is turned either by hand or by power at such a rate that the wheel carrying the bottles will make from 600 to 800 revolutions per minute, and this motion must be kept up for six or seven minutes. If this wheel is less than about twenty inches in diameter the speed should be greater, or else the whirling should be continued for a longer time.

When the bottles are placed in the machine directly after the acid is added, the separation may be affected without any extra heat, as that caused by the chemical action is sufficient to keep the fat liquid. If the bottles have stood after the acid is added until the contents are cooled below 100° F., the water in the tank should be warmed to about 200° F. before putting the bottles in the machine. The bottles should not be kept heated in the machine as high as the boiling point of water while the separation is being effected. The proper degree of heat may be obtained by lighting the burner or kerosine stove under the jacket when the machine is started; so much water having been poured into the jacket as will be just heated to boiling when the whirling is finished. In this way hot water is always available for filling the tubes at the proper time. In creameries, heat can be most easily supplied by steam connection with the boiler. If the machine is stopped after about six minutes, a layer of fat will be found upon the upper surface of the liquid in the tubes. This fat will not usually be clear; this however, will make no difference in the result, as the subsequent treatment will clarify it.

As soon as the bottles have been sufficiently whirled, they should be filled to the neck with hot water. This is most conveniently done by placing a vessel containing boiling water above the machine, and by means of a syphon, made from a small rubber tube with a glass tip, run the water directly into the bottles without removing them from the wheel. The flow of water can be perfectly controlled by a pinch-cock upon the rubber tube. If only a few tests are to be made, the bottles may be easily filled with a pipette, or by pouring from a graduate. The cover should then be replaced and the machine turned for one or two minutes, after which more hot water is added, filling the tube to about the seven per cent. mark. The fat will slowly rise into the graduated tube, losing its cloudy appearance as it passes through the hot water. When all of the bottles are filled, the cover is put upon the tank, and the machine again turned for a short time. During this time the water in the tank should be kept hot, either by placing a lamp or kerosene stove beneath it, or by pouring in a quantity of boiling hot water before starting the machine. If the fat in some of the tubes still has a cloudy appearance, the cover should be placed upon the tank and heat applied for a few minutes, when the fat should become clear and in condition to be measured. The clearing may be hastened by whirling the tubes while hot. When the bottles are allowed to cool off to a point where the fat will crystallize and then warmed again, the fat will usually be much clearer than before, but as this does not materially change the volume of fat it is considered unnecessary. Even a slight cloudy appearance does no harm.

Measuring the Fat. The fat when measured should be warm enough to flow readily, so that the line between the acid liquid and the column of fat will quickly assume a horizontal position when the bottle is removed from the machine. Any temperature between 110° F. and 150° F. will answer, but the higher temperature is to be preferred. The slight difference in the volume of fat due to this difference in temperature is not sufficient to materially affect results. A difference in temperature of 40° F. will make less than one-tenth per cent. difference in milk containing five per cent. of fat. To measure the fat, take a bottle from its socket, and holding it in a perpendicular position with the scale, on a level with the eye, observe the divisions which mark the highest and lowest limits of the fat. The difference between these gives the per cent. of fat directly. The reading can easily be taken to half divisions or to one-tenth per cent.

If the column of fat is less than about one division, as will sometimes happens with skimmilk, buttermilk or whey it may assume a globular form instead of a uniform layer across the tube; when this occurs the fat can usually be estimated with sufficient accuracy by simple inspection, but if an accurate reading is desired it may be obtained by taking four samples of the milk in four test bottles, and after treating them in the usual way, until the bottles are ready to be filled with water, adding water to three of them only, filling them as full as possible without running them over. After whirling them for a minute to bring the fat all into the neck, the fat may be poured off from these three tubes into the fourth. If any fat remains adhering to the sides of these tubes, they should be filled a second time with water and the remaining fat poured into the fourth bottle, which is then filled with water, whirled and the reading taken; this divided by four will give the per cent. of fat.

A better way would undoubtedly be to have a special test bottle, holding three or four times as much as the ordinary bottle, that could be used for skimmilk, buttermilk and whey. Three or four times the usual test sample could then be taken and by adding the proper quantity of acid, the test could be made without transferring the fat.

Cream. The chief difficulty in testing cream lies in the sampling. Cream that is sour, or that has been exposed to air until the surface has dried, cannot be accurately sampled. The same is true of centrifugal cream that is badly frothed. Sweet cream, from Cooley cans, that is not too thick to flow readily from the pipette may be tested with satisfactory results. The process, however, must be modified slightly from that used with milk, as the amount of fat in cream is so large that it cannot be measured in the ordinary test bottle, if the usual quantity is taken for the test, besides a much greater error results from the cream which adheres to the pipette than with milk. Both of these difficulties may be overcome by taking two or three tests bottles and dividing the test sample into as nearly equal portions as can be judged by the eye. The pipette is then filled with water and this is run into the tubes in the same way as the cream. If three bottles are taken the pipette is filled with water the second time and emptied into the bottles as before. This serves to rinse the cream from the pipette, and at the same time to dilute it to a point where it can be tested in the same way as milk. The bottles are then treated in the usual manner, and the reading of the tubes added together for the per cent. of fat in the cream.

Owing to the low specific gravity of cream, the test sample, if of the same volume, will weigh less than that of milk, and consequently the per cent. of fat as shown by the scale will be less than is found by gravimetric analysis, in proportion as the weight is less than 18 gms. Where a delicate balance is available, this error may be entirely avoided by weighing the cream used in a test, and calculating the per cent. of fat by multiplying the scale reading by $\frac{18}{a}$, a being the weight of the cream taken.

If 17.6 c. c. of cream is taken and the portion adhering to the pipette is rinsed into the test bottle, a close approximation of the true result may be obtained without weighing by correcting the scale reading as follows: For a scale reading of 20 per cent., add .25 per cent; for a scale reading of 15 per cent., add 0.1 per cent. Readings between these may be corrected in proportion. Below 10 per cent. no correction is necessary.

ACCURACY OF TEST.

During the past month a considerable number of comparative analyses have been made by the gravimetric method and by the new test. These are given in the following table, and show the substantial accuracy of the method. The figures are not selected, but represent all of the samples of milk analyzed by both methods between May 27 and July 15. The gravimetric analyses were made by drying the milk upon asbestos and extracting with ether. In analyses by the new test, no readings were made to less than one-half a division of the scale, or to 0.1 per cent. The figures in the second decimal place are derived from corrections for the quantity of milk used in the test, 15 c. c. and 20 c. c. of milk having been taken in many of the preliminary trials. These comparative analyses were mostly made with milks from single cows, as such present greater difficulties than mixed milk.

COMPARATIVE RESULTS BY THE NEW AND GRAVIMETRIC METHODS.

Per cent. of Fat.

Kind of milk.	By new test.	By gravimetric analysis.
Single cow — Bunn, grade Holstein	3.64	3.72
Skimmilk	.20	.21
Single cow — Bessie's heifer, $\frac{15}{16}$ Jersey	6.44	6.55
Single cow — Mattie, grade Holstein	3.63	3.60
Single cow — Topsy, grade Holstein	3.35	3.33
Cream	22.98	22.69
Single cow — Bunn, grade Holstein	3.29	2.99
Single cow — Rose, grade Jersey	3.93	4.00
Single cow — Sylvia's heifer, high grade Jersey	4.57	4.73
Single cow — Doubtful, high grade Jersey	4.98	4.91
Cream	21.25	21.47
Single cow	3.75	3.87
Mixed milk	4.69	4.77
Single cow — Flossie, registered Jersey	5.31	5.38
Single cow — Bessie, high grade Jersey	5.08	5.14
Single cow — Nettie, high grade Jersey	5.32	5.40
Single cow — Daisy, grade Jersey	4.69	4.56
Single cow — Rose, grade Jersey	5.39	5.37
Mixed	5.98	5.94
Single cow — Jersey	6.91	6.87
Whey	.68	.61
Cream	17.96	18.08
Skimmilk	.89	.81
Single cow — Bessie's heifer, $\frac{15}{16}$ Jersey	6.95	6.81
Single cow — Sylvia, grade Jersey	6.44	6.43
Single cow — Dolly, grade Jersey	5.75	5.64
Single cow — Bryant, grade Jersey	4.22	4.24
Single cow — Daisy, grade Jersey	4.69	4.70
Single cow — Bunn, grade Holstein	2.87	2.98
Single cow — Grade Jersey	4.10	4.03
Single cow — Daisy's heifer, grade Jersey	4.22	4.02
Single cow — Galena, high grade Jersey	4.45	4.31
Single cow — Topsy, grade Holstein	3.40	3.23
Single cow — Mattie, grade Holstein	3.28	3.41
Single cow — Annie Johnson, registered Jersey	5.04	5.10
Single cow — Annie Johnson, registered Jersey	5.16	5.22
Buttermilk, sweet cream	3.00	3.09
Cream	16.10	16.18
Buttermilk, sour cream	.40	.58
Buttermilk	1.40	1.63

TIME REQUIRED FOR MAKING THE TEST.

On account of the large number of tests which may be carried along together and the little attention which each demands, the average time required for a test is very small. Two samples of milk may be tested in duplicate in fifteen minutes, including all of the work from the mixing of samples to the cleaning of the bottles. After the milk has been measured, sixty tests may be made in less than two hours, including the cleaning of the bottles.

EXPENSE OF THE TEST.

The cost of the test will depend upon the price of commercial sulphuric acid. The wholesale price of this acid is about two cents per pound. At retail it can be bought at from three to five cents, according to the quantity obtained. One pound of acid is sufficient for fourteen tests. In a factory where acid is purchased by the carboy, it should not cost more than one-fifth cent per test, and in no case should it cost more than one-half cent per test.

The breakage of bottles, if properly made, is so slight that it need not be considered. We have made upwards of 2000 tests, in which only fifty bottles have been used, and only one of these bottles has been broken. The chemicals do not act upon the glass, and the bottles are only broken by accident or careless handling.

CLEANING THE TEST BOTTLES.

The bottles should be emptied while hot and afterward rinsed twice with hot water; they are then ready for another test. In emptying the bottles they should be inverted and given a circular motion, which causes the liquid to form a whirlpool and allows air to enter continuously in the center of the tube; in this way the bottles may be emptied and cleansed rapidly without leaving fat attached to their sides.

FURTHER PRECAUTIONS.

The sulphuric acid used should be kept out of reach of all persons except those making the test, and great care should always be taken in handling it as it is very corrosive.

If the fat does not separate clear from the acid liquid when water is added to bring it into the neck, it indicates that the acid used is too weak and more should be used. If the fat separates clear from the acid, but is blackened, it shows that the acid is too strong, and it should be diluted to a specific gravity of 1.82 before using, or a little less of the acid could be used for the test.

It sometimes happens in testing buttermilk, that is quite sour, that the addition of water to bring the fat into the neck of the bottle where it can be measured, causes a precipitate of casein or other matter which mingles with the fat and prevents an accurate reading. This difficulty has also occurred a few times with milk that had stood a considerable time before testing; it may be entirely avoided by filling the bottles with a hot mixture of equal parts of sulphuric acid and water instead of water alone.

The greatest source of error is in the graduation of the tubes, and no one should purchase tubes except from reliable parties who will guarantee their accuracy.

The above is an accurate method of determining the amount of fat in milk, and promises to be of great use to the dairyman. It is used in the laboratory to select those milks which, containing a low per cent. of fat, are to be subject to further analysis.

Analysis of Milk.—The adulteration of milk is determined by a more or less complete analysis of the sample. Except in special cases the analysis is confined to a determination of the three constituents, viz.: Total solids, fat, and solids not fat. To understand the significance of a milk analysis a knowledge of the methods employed is necessary. There are many methods in use, differing slightly in material used or manner of manipulation. Each analyst selects the one most adapted to the conditions under which he works and the apparatus at his disposal. The method employed in the State laboratory is as follows: A nickle-plated perforated copper tube is filled with washed and ignited asbestos, and carefully dried at 100° C. The tube and contents are weighed and about 2 c. c. of the well-mixed milk are dropped on the asbestos, and the tube again weighed. The difference in the two weights gives the weight of the milk taken. The tube is then placed in a drying oven, heated by gas and containing a thermometer by which the oven is kept at a temperature of 100° C.

(212 ° F.) Here the tube and its contents are kept till all the water is expelled; this generally takes three hours. It is then removed, allowed to cool in a desiccator and weighed. The final weight is the weight of the tube plus the total solids of the milk. The loss in weight from the combined weight of the tube and milk is the weight of the water in the milk taken. The fat is now determined by placing the dried tube in a fat extractor and subjecting it to the action of dry ether. The ether dissolves the fat from the milk solids, but has no effect on the solids not fat. The solution of fat in ether is received in a weighed glass flask, the ether is distilled off, leaving the fat behind. The flask and fat are now placed in the drying oven, allowed to remain till the last traces of ether have been driven off, removed, cooled and weighed. The increase of weight in the flask represents the amount of fat present in the milk. From these figures a simple calculation will give us the percentage composition of the milk. The figures obtained from an analysis like the above will enable the chemist to judge of the quality of the sample in hand, so far as the removal of cream or the addition of water is concerned. Adulteration by skimming is shown by the low per cent. of fat. This may be as in cases found in Milwaukee as low as one per cent. In determining if a sample of milk has been watered, advantage is taken of the fact that the solids not fat of herd milk rarely falls below nine per cent. Taking, then, nine per cent. as the standard for solids not fat, the amount of water added may be calculated. The following analysis of a sample of milk delivered at a cheese factory shows the effect of watering. Total solids, 8.58; fat, 2.33; solids not fat, 6.25. The amount of water added is determined by the following proportion: 8 : 100 : : 6.25 : x; x = 69.45. The milk, therefore, contained, if the standard was fixed at 9 per cent. solids not fat, 69.45 parts of standard milk, and 30.55 parts of added water.

It is estimated that about 90 per cent. of the adulteration of milk is in skimming and watering. The adulteration of the other 10 per cent. consists in the addition of material to preserve the milk, to increase the specific gravity, or to improve the appearance of the milk. The following substances have been used as adulterants: cane sugar, glucose, flour, starch, dextrine, solution of starchy substances, gum arabic, gum tragacanth, yolk of egg, white of egg, caramel, brown sugar, gelatine, isinglass, licorice juice, brown extract of chicory, extract of marigold, carrots, annotto. The following cases are also on record: the addition of glycerine, emulsions of oleaginous seeds, also the addition of old milk, buttermilk and condensed milk to conceal watering. Preservatives are also added: bicarbonates of soda, boracic acid and borates, salicylic acid, common salt and glycerine have been found.

The great majority of cases consists in the removal of cream or the addition of water. The addition of water is not only a direct fraud on the consumer, but recent investigations would indicate that this addition of water may bring about the spread of contagious diseases. Chas. Girard (Rapport sur les Travaux du Laboratoire Municipale 1885), makes the following statement: "It is well known that water is a vehicle for contagious diseases; wells, cisterns, receptacles of every description that serve for the storage of water, may become charged with organic matters injurious to health. Thus it is that milk which by itself is very liable to fermentation, becomes dangerous when mixed with contaminated water. A great number of ferment germs may be introduced into the milk and there developed with great rapidity. Milk dealers in Paris have been known to add to their cans water taken from the gutter. Such water, infected with germs and putrid matter, constitutes a veritable poison. Diarrhœal diseases, vomiting and colics are the invariable sequences of the ingestion of milk adulterated with such matter."

The frequent tracing of the source of typhoid and scarlet fever to a contaminated milk supply, shows that this fear is not by any means an idle one. The presence of nitrates and nitrites is direct proof of the use of contaminated water. These salts are not found in normal milk, even if the salts have been fed to the cows.

Cane sugar is added to conceal watering; its use, however, must be limited, as any large amount will give a decided sweet taste. Glucose, flour and other starch containing substances, dextrine and gums are added for the the same purpose as cane sugar, to give a body to watered milk. Gum tragacanth has been used, not for increasing the specific gravity, but to cause the milk to froth. Coloring matter as annotto and carrots are very liable to be found in watered milk. Skimmed milk having too blue a tint, the coloring matter is added to bring back the yellow tint which to the public eye is a guarantee of purity. A simple method for testing for annotto is as follows: one hundred c. c. of the suspected milk are rendered alkaline by the addition of 5 c. c. of a solution of carbonate of soda, and are poured into a jar five inches high. A strip of filter or blotting paper five inches long by one-half wide is then placed in the jar and allowed to stand in the dark for twelve hours. This strip is removed, carefully washed, when if annotto is present, it will be of a pale salmon color, and if dipped into a solution of stannous chloride will show a pink color. The addition of coloring matter to milk is usually in the form of an alkaline solution. Sometimes, however, a mixture devised especially for the purpose is used. A mixture of this kind largely used in San Francisco, had the following composition; common salt, saltpetre, traces of caustic soda, and a large quantity of sugar. The color is due to caramel. The above compound is dissolved in water and the solution used for adulterating milk.

Decomposition of Milk.—Milk when left to itself at a temperature of above 90° F. undergoes rapid decomposition. The first sign of this breaking up is the evolution of carbonic acid gas. The fermentation is arrested at this point by means of heat or antiseptics, the decomposition is arrested and the milk remains sweet. If the fermentation is allowed to continue, the next step is coagulation of the casein, owing to the formation of lactic acid. The formation of lactic acid from the milk sugar gives its name to this species of ferment. As has been shown by Pasteur, the lactic ferment is due to the presence and growth of one of the lower organisms. This ferment on being added to a solution of sugar, changes it to lactic acid. The presence of the acid interferes with the growth of the organism, and finally terminates it. The maximum amount of lactic acid formed under ordinary conditions is 0.80 per cent.

Butyric Fermentations.—When milk has been subjected to heat with a view of preserving it, coagulation of the casein sometimes takes place after a certain time. On examination the milk is found to be alkaline, and it contains no lactic acid. If the fermentation is in an advanced condition the odor is very offensive. The odor of rancid butter is due to the formation of butyric acid.

Slimy Fermentation. In some parts of Norway the people are said to be fond of ropy milk and use it as a regular article of diet. The ropy milk is said to be prepared either by giving the cows grass or hay containing a certain plant (Pinguicula vulgaris), or by rubbing with this plant the interlor of the vessols used for storing the milk. The milk then gets ropy, the cream is prevented from rising; the taste is insipid and after some time it becomes slightly sour. Milk in this condition is almost unchurnable, and the yield of butter is very small, consequently ropy milk is undesirable. Ropy milk is said to be produced by a variety of causes; illness of the mammary glands, inflammation of the udder, cold of the same organ contracted by lying down on the ground, atmospheric influences, fodder containing certain plants, distillery slop, unclean rooms and utensils, etc. The remedies are equally numerous. The alleged causes for ropy milk point to two assumptions: either the milk when drawn from the cow is infected with the ferment or the milk is infected after it is drawn from the cow. No experiments have been made to prove or disapprove the first assumption. That ropy milk may be caused by infection after it has been drawn from the cow has been proved by experiment. If sterilized milk be inoculated with ropy milk and kept at a suitable temperature it will be observed that no cream rises to the top and that the milk gets ropy within twenty-four hours. After forty-eight hours have elapsed the milk is of such consistency that it will not flow out of the vessel containing it, even if the latter be turned upside down. The most suitable temperature for this development is 86–104° F. The energy of the ferment diminishes with rise of temperature, and at 140° F. it is entirely destroyed. Freezing prevents the development of the ferment but does not kill it.

Blue Milk. In rare cases milk has been known to undergo a peculiar change of color becoming in spots of a bright blue color. As in the case of ropy milk the blue color is due to the presence of a peculiar ferment. The bacillus does not develop at a temperature below 50° F. The most suitable temperature is from 60° to 65° F. It ceases to be developed at a temperature of 99° F. The above changes are the result of the action of a specific ferment, and in the cases noted the change is not of such a nature that the milk becomes dangerous to health by the formation of poisons in the milk. Other changes, however, do take place which are not so innocent. Various fermentative changes take place which result in the development of animal poisons or ptomains. To these poisons generated in milk are due the many cases of poisoning which have been reported from milk, ice cream, cheese, etc.

Vaughn was the first to investigate this questisn of poisonous milk, and in 1884 he isolated from poisonous cheese an animal poison or ptomaine, a substance which has since been found in milk and ice cream. Vaughn has given to this poison the name of tyrotoxicon. In cases where this poison has been found in milk or milk products, it has been found that the milk has been drawn from the cows, and immediately, without cooling, transported several miles in the hot sun, or else the surroundings have been of such a nature that the milk readily underwent putrifactive changes. A peculiarity is that the milk gives no notice either by appearance or taste of containing this dangerous substance.

During the years 1883–84, there were reported to the Michigan Board of Health some 300 cases of cheese poisoning. All these were caused from eating from twelve different cheeses. On these cases Prof. Vaughn makes the following report: "I received larger or smaller samples of each cheese for analysis. After many months of experimentation I succeeded in isolating a poison from this cheese which produced upon animals and man symptoms similar to those from eating the same cheese." The substance which produced these effects was the poison tyrotoxicon. Dr. D. B. Collins, of St. Peter, gives the following report of the condition of some children living in Kasota, Minn., who were poisoned by eating cheese. The poisoning occurred June 7, 1888.

"On the evening of June 7th I was called to Kasota to see some children who, the messenger stated, had been poisoned. Upon my arrival I found three children, aged six, four and three, who were sick. They had been suddenly taken with vomiting, cramps and purging. There were in two cases well marked symptoms of collapse. The pupils of the eyes were widely dilated; the youngest was inclined to be comatose, when convulsive tendency was absent. The pulse was small and rapid, and the action of the heart labored and irregular; the following history was given: A number of families were assembled at one of the houses, and dinner was sent to the company, who all ate heartily. Cheese was on the table, and it was observed that all who partook of it in any quantity, were more or less affected, the greatest effect being produced on the young children. While at these cases I was called to another house where I found four children ill, ranging from five to eleven years of age. The symptoms were the same as detailed above. Toward morning, of the same night, I was called to another family where I found six with the same symptoms. All had eaten of the same cheese, and there seemed to be nothing else to which the illness could be attributed. In all the cases the symptoms were apparently proportioned to the amount of the cheese which had been eaten." A portion of the suspected cheese was sent to the state chemist, and the presence of tyrotoxicon demonstrated.

The following rules concerning the care necessary to prevent milk undergoing these putrifactive changes have been given by Dr. Vaughn:

1. The cow should be healthy, and the milk of any animal which seems indisposed should not be mixed with that from perfectly healthy cows.

2. Cows must not be fed upon swill, or the refuse of breweries, or glucose factories, or upon any fermented food.

8. Cows must not be allowed to drink stagnant water, but must have access to pure fresh water.

4. Cows must not be worried or heated before being milked.

5. The pasture must be free from noxious weeds and the barn and yard must be kept clean.

6. The udder should be washed, and then wiped dry, before each milking.

7. The milk must at once be thoroughly cooled. This is best done in the summer by placing the can in a tank of cold water, or ice water, the water being the same depth as the milk in the can. It would be well if the water in the tank could be kept flowing; indeed, this is necessary unless ice water is used. The tank should be thoroughly cleaned to prevent bad odors. The can should remain uncovered during cooling, and the milk be gently stirred. The temperature should be reduced to 60° Fah. within an hour. The can should remain in the cold water until ready for delivery.

8. In summer, when ready for delivery, the top should be placed on the can and a cloth wet with cold water should be spread over the can, or refrigerator cans may be used. At no season should the milk be frozen, but no buyer should receive milk which has a temperature higher than 65° Fah.

9. The only vessels in which milk should be kept are tin, glass or porcelain. After using the vessel it should first be rinsed with cold water, then scalded, and if possible, exposed to the air and thoroughly dried.

When these rules are put into operation, milk can be preserved free from putrefactive changes for a reasonable length of time, and it will remain fresh and palatable. When such care is not exercised, milk may become as we have seen, highly poisonous within a few hours after it is drawn from the cow.

Preservation of Milk.—Many processes have been suggested for the preservation of milk. They may be classified as follows:

1. Evaporation, in which the milk is reduced to a dry powder and mixed with sugar, the evaporation being made either in a vacuum or in a stream of warm dry air.

2. Chemical additions.
3. Application of cold.
4. Application of heat and then of cold.

The presence of water is necessary to putrefaction. If, therefore, we reduce milk to the form of a dry powder, it will keep for several weeks without any further change. If sugar is added to the mass the preservation is made permanent. The next step was the heating of the milk for a sufficient length of time to destroy all germs and sealing while hot. Various modifications of the above methods have been patented, but they have gradually become limited to a method by which the milk is condensed in vacuum pans and sealed up in air tight tin cans, with or without the addition of sugar. This forms the well known condensed milk of commerce.

Various methods for preserving milk have been proposed, based on the use of various antiseptics, but they are generally looked on with suspicion. Concerning the use of antiseptics in milk, Blyth says: "All these methods of preserving milk have, it is obvious, no effect in destroying the germs of disease possible to be communicated to man. Speaking generally, indeed, all addition to milk in the form of antiseptics, such as glycerine, salicylic acid, borax and the like, should be looked on with disfavor, for by their use cleanliness in the dairy would not be such an essential as it is now, and the addition of these antiseptics is somewhat analogous to the saturation of foul places with carbolic acid, when the more obvious and more effectual remedy would be to keep them free from filth."

The use of antisepties is at best but a make shift as their addition has not the effect of destroying the fermentative organism but simply of diminishing or retarding their development, and their action will be seen after the milk has stood for a time. The most powerful disinfectants, containing acids and compounds of the heavy metals are absolutely excluded, either because of their decomposing action on the milk or their effect on the human body. The antiseptics, therefore, which can be used for the preservation of milk are limited to a few of the milder ones. Such as boracic acid and borates, carbonates, salicylic acid, glycerine, etc. Glycerine as an antiseptic is not a success, unless an excess is added, while the cost and taste given to the milk would be enough to prevent its use to any extent. In fact antiseptics for the preservation of milk are limited to the following: Boracic acid and borates, salicylic acid, bicarbonate of soda. The bicarbonate of soda does not act as an antiseptic but is added to neutralize the lactic acid and thus prevent the coagulation of the milk.

As regards the action of salicylic acid, there is no doubt that even in the small quantities used in preserving milk, it exercises an injurious effect on the human body. In relatively small amounts, salicylic acid has the property of killing the micro organism, and thus retarding the process of fermentation. Small quantities prevent the coagulation of milk, and have an energetic action on the juices of the liver and the stomach. It was found by Müller that one-thousandth part of salicylic acid destroys three-fourths of the digestive power of pepsin, and four one-thousandths destroys it entirely. On all organisms that produce fermentation and putrifaction, salicylic acid has a decided action. When taken into the human system it produces various symptoms, as constipation, buzzing in the ears, cerebral congestion, sometimes nausea. A weakening of the pulse and a lowering of the mean bodily temperature have also been noticed. In consequence of the decided poisonous action of the acid when taken into the system, its use in the preservation of food has been forbidden in Germany. In France its use as a preserving agent in any form of food or drink was forbidden by ministerial decree on February 7, 1881. The decree was based on the decision of the consulting committee of hygiene that its constant use was dangerous to health.

Borax and boracic acid have been largely used for the preservation of milk. The same objection is made to borates as to the other antiseptics, viz., that a chemical sufficiently powerful to prevent fermentation should not be taken into the system. In consequence of the somewhat feeble antiseptic properties of boracic acid, larger quantities of it must be used in the milk if the milk is to be preserved for any length of time and the consequences of taking once or twice a day, a medicinal dose of so active an agent as boracic acid cannot be lightly overlooked.

Milk is one of the most complex of organic compounds, and like all products of animal life is subject to rapid decomposition. It contains matters partly in suspension and partly in solution. Milk sugar, casein, albumen, galactine and a number of salts are in solution in water. The fat is present as an emulsion and part of the casein is in the form of small granules. It is evident that before the chemist can judge of the purity of so complex a compound, he must have definite information concerning its percentage composition, and the greatest variation to which each constituent is liable. Fortunately an immense amount of chemical work has been done on this subject. The analysis of thousands of samples from animals of different breeds under varying conditions of food, age and health, have supplied us with well defined data on the composition and variations of constituents.

The average composition of cow's milk is as follows:

Fat		3.5 per cent.
Milk serum	Nitrogenous matter	4.3 per cent.
	Milk sugar	4.5 per cent.
	Ash	.7 per cent.
	Water	87. per cent.

The above figures are the average of many thousand analyses and represent the average composition of herd milk. The following table shows the composition of milk as found by analyses in differents parts of the world and under all the varying conditions which affect the production of milk:

Chemist.	Number of cows.	Total solids.	Fat.	Solids not fat.
James Bell	216	12.83	3.83	9.00
James Bell	24 dairies	13.22	4.12	9.10
C. Estecourt	22 dairies	12.74	3.37	9.37
J. Carter Bell	183 cows	13.60	3.70	9.90
J. Cameron	42 cows	13.47	4.00	9.47
C. Cameron	40 cows	13.00	4.00	9.00
C. Cameron	100 cows	13.85	4.60	9.25
Fleischman & Vieth	120 cows	12.22	3.20	9.02
Vieth	60 cows	12.80	3.10	9.70
Vieth	9120 cows	13.03	3.52	9.51
Wanklyn	Average	12.50	3.20	9.30
A. Winter Blyth	Average	13.13	3.50	9.63
Marchand	Average	12.85	3.55	9.30
H. Chevalier	Average	12.98	3.13	9.75
Vernois Becquerel	Average	13.60	3.60	10.00
Payen	Average	13.40	3.50	9.90
O. C. Wiggin	58 cows	14.08	4.01	10.07
E. Calder	27 cows	12.77	3.32	9.45
Sharples	34 cows	14.15	4.62	9.53
Haidlen	Average	12.70	3.00	9.70
Letheby	Average	14.00	3.90	10.10
J. Koenig	Average	12.70	3.00	9.70
Boussingault	Average	12.60	4.10	9.50
Muspratt	Average	13.57	4.43	9.13
Dieulafait	Average	12.36	3.11	9.25
Bizanez	Average	14.30	4.31	9.99
Brinton	Average	14.00	4.50	9.50
Chandler	1,700 qts	12.55	3.83	8.72
Newton	Average	12.50	3.50	9.00
Bartley	Average	12.50	3.50	9.00
White	Average	12.50	3.50	9.00
Waller	Average	12.50	3.20	9.30
Babcock	Average	14.47	5.09	9.38
Church	Average	13.70	3.70	10.00
E. Smith	Average	13.60	3.61	9 99
Martin	Average	12.50	3.20	9.30
Boudet	Average	13.00	4.00	9.00
Adam	5 Dist. near Paris	13.10	4.10	9.00
Babcock	130 cows	13.11	3.45	9.66
Girard	Average	13.30	4.00	9.30
Bouchardat	Average	13.30	4.10	9.20
Davenport	31 cows	13.32	3.20	9.62
Wurtz	Average	13.50	4.00	9.50
Sharples	19 cows	14.49	4.83	9.66
Newton	5 dairies in N. Jersey.	13.80	4.22	9.58
Martin & Moeller	296 cows in N. Jersey.	13.73	4.21	9.52

The above analyses represent many thousand samples of milk, and the analyses were conducted by men who have made a careful study of the question of milk production. An examination of the table will show that in no case does the fat fall below three per cent., while it frequently runs above four.

The average of 360 analyses made by Dr. Bostock Hill, being the mixed milk of dairies containing over ten cows, is as follows: Total solids, 12.5; fat, 3.2; solids not fat, 9.3.

The Agricultural Experiment Station of New Jersey has made a series of monthly analyses of milk from twelve dairies. The herds contained from seven to thirty-six cows each. In all 100 analyses were made and the average for one year was 12.99 per cent. of total solids. The analyses of 130 samples of milk taken from the milk dealers of Boston, gave the following: Total solids, 13.11; fat, 3.45; solids not fat, 9.66. The milk from 300 Short-horn cows for the space of three years gave the following average:

	1881.	1882.	1883.
Total solids	13.00	13.01	13.00
Fat	3.80	3.80	3.70
Solids not fat	9.20	9.21	9.30

Völcker examined five different breeds of cattle from 1881 to 1884 and obtained the following results:

	Total solids.	Fat.
Short-horns	12.6	3.7
Jerseys	13.5	4.1
Guernseys	13.9	4.6
Ayrshires	13.5	4.2
Dutch	12.00	3.1

As the result of analyses like those given, different states have adopted standards for pure milk as follows:

Wisconsin, three per cent. of fat.
Massachusetts, thirteen per cent. of solids.
New Jersey, twelve per cent. of solids.
New York, twelve per cent. of solids; three per cent. fat.
innesota, twelve per cent. of solids; three per cent. fat.
England, total solids, 12.00 per cent.; fat, 2.5.
France, total solids, 13.00 per cent.; fat, 4.0.
Canada, total solids, 12.00 per cent.; fat, 3.5.

There if no doubt that the standard required by law in this state is much below the average composition of herd milk, and that only in rare instances does the mixed milk from two or more cows fall below the standard.

In assuming a certain standard for the quality of milk it is difficult to fix upon a standard which would be fair in all cases. If we were dealing with individual cows it would be almost impossible to fix upon a standard which would be just to both the producer and consumer. In case of individual cows, milk has been found which was very low in fat and total solids. A sample analyzed by Bell, had the following composition: total solids, 9.10; solids not fat, 8.04; fat, 1.06.

On investigation the milk was found to have come from half starved cows, whose only feed was a little hay. Milk of the above quality is very exceptional; it is not so rare, however, to find milk from individual cows, with a fat constituent just under three per cent. Fortunately, it is very seldom that milk from single cows is offered for sale. Consequently, the milk which comes under the chemist's observation is herd milk.

A lower standard might be a benefit to the poor feeder or to the breeder of cows giving watery milk, but to the consumer it would be an injustice. So long as the great majority of milk is far above the present standard, a lowering of it would open the door for a systematic skimming and dilution of milk. To meet those cases where the cows may be giving milk below the standard, it has been the custom of the commission, when a milk is suspected, to send an officer and have him see the cows milked, and take a sample from the mixed milk of the herd. The following two examples will show the success of this method:

No. 1. Sample taken at creamery.
Solids, 8.40; fat, 2.79; solids not fat, 5.61.

No. 2. Taken from herd.
Solids, 12.64; fat, 3.89; solids not fat, 8.85.

Sample No. 1. From creamery.
Solids, 8.58; fat, 2.33; solids not fat, 6.25.

Sample No. 2. From herd.
Solids, 12.15; fat, 3.66; solids, not fat, 8.48.

It is evident that taking a second sample as in the above cases, does away with the chance of any injustice, and at the same time confirms the character of the first sample.

The following table is of great interest to dairymen and factorymen. An examination will show at a glance the wide difference that exists in the quality of milk. Nothing can demonstrate more clearly that the factorymen should pay for the milk just what it is worth in butter fat. It is also very apparent to the producer that he cannot afford to place the milk from his cows, which contains four per cent. of butter fat, against his neighbor's cows, which give but three per cent.

ANALYSIS OF MILK.

Lab. No.	From whom taken.	Address.	Butter fat.	Lab. No.	From whom taken.	Address.	Butter fat.
79	A. J. Decker	Fond du Lac.	3.89	268	M. Kundert	Milwaukee	3.0
98	J. Coiell	Lindon	3.	269	C. Steger	Milwaukee	3.6
99	H. Brewer	Lindon	3.8	270	C. Seigel	Milwaukee	1.6
100	Grant Batton	Lindon	3.2	271	Vin. Wiskocil	Milwaukee	4.0
101	N. J. Jacobs	Lindon	3.8	272	John Adler	Milwaukee	3.4
102	John Hillery	Lindon	2.6	273	August Netz	Milwaukee	3.2
103	W. S. Batton	Lindon	2.4	274	C. L. Porath	Milwaukee	1.6
104	John Batton	Lindon	4.4	275	Aug. Gruetner.	Milwaukee	3.4
105	C. Tremaine	Lindon	4.3	276	J. A. Hess	Milwaukee	3.4
106	James Fox	Lindon	4.2	277	John A. Smith.	Milwaukee	3.2
173	McIntyre, Elston & Co	Muscoda	4.8	278	Mich. Kieraus	Milwaukee	3.2
				279	M. P. Edwards.	Milwaukee	1.2
182	Springfield Cr.	Springfield	4.40	280	Wm. Dooley	Milwaukee	3.6
182a	Springfield Cr.	Springfield	4.10	281	F. Kaufman	Milwaukee	4.6
182a	Springfield Cr.	Springfield	4.20	282	J. M. Marlett	Milwaukee	4.0
182a	Springfield Cr.	Springfield	4.61	283	H. Johnson	Milwaukee	3.0
182a	Springfield Cr.	Springfield	3.40	284	C. Willis	Milwaukee	1.0
182a	Springfield Cr.	Springfield	5.00	285	Ed. Luby	Milwaukee	3.0
182a	Springfield Cr.	Springfield	3.94	286	A. Berry.	Milwaukee	3.4
182a	Springfield Cr.	Springfield	2.60	287	Mrs. Leopold	Milwaukee	3.0
182a	Springfield Cr.	Springfield	3.80	288	Wm. Hughs	Milwaukee	3.2
182a	Springfield Cr.	Springfield	4.30	289	C.Tannhaueser	Milwaukee	3.0
182a	Springfield Cr.	Springfield	3.42	290	A. Hoffman	Milwaukee	3.2
182a	Springfield Cr.	Springfield	4.30	291	Martin Berg	Milwaukee	3.4
182a	Springfield Cr.	Springfield	3.60	292	Martin Berg	Milwaukee	3.0
182a	Springfield Cr-	Springfield	4.02	293	Alois Hoffman	Milwaukee	2.4
182a	Springfield Cr.	Springfield	4.00	294	Phillip Mueller.	Milwaukee	3.2
182a	Springfield Cr.	Springfield	3.94	295	Waukesha Co	Milwaukee.	4.6
182a	Springfield Cr.	Springfield	4.30	296	P. Hagenah	Milwaukee	2.8
182a	Springfield Cr.	Springfield	3.41	297	Waukesha Co	Milwaufkee	3.8
182a	Springfield Cr.	Springfield	4.06	298	Waukesha Co	Milwaukee	2.6
182a	Springfield Cr.	Springfield	4.00	299	Waukesha Co	Milwaukee	5.2
182a	Springfield Cr.	Springfield	4 61	300	Waukesha Co	Milwaukee	3.8
182a	Springfield Cr.	Springfield	4.40	403	Hugh Roden	La Crosse	4.1
182a	Springfield Cr.	Springfield	4.20	404	P. N. Roberts	La Crosse	3.6
182a	Springfield Cr.	Springfield	3.92	405	Fred. Luck	La Crosse	3.8
183	Springfield Cr.	Springfield	3.99	406	Geo. Kalb	La Crosse	4.0
193	J. B. Eiche	Meeme	4.20	407	Mary Bovin	La Crosse	4.0
197	Thos. Schuette	Hustisford	5.00	408	J. P. Miller	La Crosse	3.2
227	H. A. Fowler	Whitewater	4.20	409	Wm. Bradley	La Crosse	4.4
237	F. Utter	Milwaukee	4.20	410	Jacob Eberli	La Crosse	3.8
238	C. Oelke	Milwaukee	2.60	411	Fred Betz	La Crosse	4.0
239	A. Selinister	Milwaukee	3.80	442	Levi Decker	Madison	4.42
240	P. Kaernerling	Milwaukee	3.40	443	D. H. Collins	Madison	4.25
				444	J. P.Woodward	Madison	4.59
241	J. Siedler	Milwaukee	3.40	445	Fred Marks	Madison	4.25
242	G. Dorband	Milwaukee	4.60	446	H. H. Davis	Madison	3.74
243	J. Meier	Milwaukee	3.2	447	Lutag Leucer	Madison:	4.08
244	F. Meister	Milwaukee	2.4	448	Harwood Boyd	Madison	4.16
245	T. Kaemerling.	Milwaukee	2.2	449	Jos. Pearson	Madison	4.16
246	F. Boeder	Milwaukee	3.8	450	Robert Gray	Madison	4.40
247	A. W. Goss	Milwaukee	3.4	451	J. J. Pfeister	Madison	4.25
248	F. Peters	Milwaukee	3.4	452	P. O'Dea	Madison	4.33
249	J. F. Mueller	Milwaukee	4.0	453	E. M. Smith	Madison	4.93
250	M. Boeder	Milwaukee	3.6	454	G. C. Russell	Madison	4.00
251	F. Judes	Milwaukee	3.0	455	J. H. Keizer	Madison	4.32
252	Ed. Zeilke	Milwaukee	4.8	456	S. Rath	Madison	5.1
253	Z. Douglas	Milwaukee.	3.0	457	W. S. Rice	Janesville	3.4
254	A. Stuth	Milwaukee	4.4	458	Mrs. A. B. Hughes	Janesville	3.48
255	J. F. Drefal	Milwaukee	2.8				
256	John Brimmer	Milwaukee	3.4	459	C. A. Downing.	Janesville	3.4
257	F. A. Abbott	Milwaukee	2.8	460	Joseph Bennett	Janesville	3.74
258	Gebhardt & Kortendick	Milwaukee	4.2	461	C. Knudson	Janesville	2.72
				462	W. S. Rice	Janesville	3.06
259	W. McKowen	Milwaukee	4.4	463	Henry Rooney.	Janesville	3.15
260	Mayer Bros	Milwaukee	4.0	464	G. Shurtleff	Janesville	2.94
261	J. Studeman	Milwaukee	3.6	465	M. M. Phelps	Janesville	3.64
262	A. Noete	Milwaukee	4.2	466	W. S. Rice	Janesville	4.08
263	Gregor Wolf	Milwaukee	4.4	467	M. E. Williams	Deerfield	3.76
264	Fred Vollmer	Milwaukee	4.0	468	J. Redmond	Deerfield	3.40
265	J. L. Shaefer	Milwaukee	4.0	469	M. Nickelson.	Deerfield	3.57
266	R. W. Bischoff	Milwaukee	3.4	470	Mary Prescott.	Deerfield	3.91
267	M. Kruger	Milwaukee	3.4	471	C. Fall	Deerfield	3.23

ANALYSIS OF MILK.—Continued.

Lab. No.	From whom taken.	Address.	Butter fat.	Lab. No.	From whom taken.	Address.	Butter fat.
472	Ole Anderson	Deerfield	3.85	595	C. Shausberg	Waterloo	3 50
473	E. Heugum	Deerfield	3.30	596	C. Sied.	Waterloo	3.89
474	A. Inammen	Deerfield	3.64	597	H. Gotchatt	Waterloo	3.52
475	H. Christonsen.	Deerfield	4.16	598	H. Dreger	Waterloo	3.54
476	N. Risland	Deerfield	3.85	599	J. Poutch	Waterloo	4.01
477	O. G. Lee	Deerfield	3.40	600	F. Creuger	Waterloo	3.62
478	G. J. Johnson	Deerfield	2.79	601	A. Glauvitz	Waterloo	4.12
479	M. O. G. Hoel.	Deerfield	3.40	602	E. Pekhauer	Waterloo	4.05
480	C. O. Johnson.	Deerfield	3.40	603	E. Sack	Waterloo	4.03
481	J. Christonson.	Deerfield	3.39	604	F. Rodloff	Waterloo	3.50
482	O. K. Brumberg	Deerfield	3.23	605	F. Schich	Waterloo	3.74
483	S. Oleman	Deerfield	3.74	606	C. Korth	Waterloo	3.62
484	A. Nelson	Deerfield	3.60	607	C. Gruchow	Waterloo	3.62
485	F. Langl	Deerfield	3.40	608	J. Kiecker	Waterloo	3.74
486	J. O. Bruetson.	Deerfield	3.23	609	W. Muldenhouse	Waterloo	3.50
533	Geo. Bower	Baraboo	3.21	610	Chas. Kezo	Waterloo	3.56
534	D. Ruggles.	Baraboo	3.30	611	W. Schader	Waterloo	3.30
585	Smith & Savage	Baraboo	3.79	612	A. Segkoar	Waterloo	3.55
536	Adam Thuerer.	Baraboo	2.71	613	Geo. Goehl.	Waterloo	3.62
537	Ben Simors	Baraboo	3 95	614	A. Kilian	Waterloo	3.80
538	E. L. Parmer	Baraboo	3.96	615	C. Cufol.	Waterloo	3.68
539	M. Aiken.	Janesville	3.60	625	John Garren	Neptune	3.40
540	J. Banfield	Janesville	3.40	626	Robt. Reagles.	Neptune	3.52
541	J. Banfield	Janesville	2.20	627	Wm. Hearsh	Neptune	3.45
542	Ed. Wheeler	Janesville	3.40	628	A. Reagles.	Neptune	3.87
543	F. Kaurtz	Waterloo	3.46	629	F. Klokow	Neptune	3.05
544	A. Beanstalk	Waterloo	3.96	630	G. Thomas	Neptune	3.75
545	R. Johnson	Waterloo	3.21	631	S. Faber	Neptune	3.87
546	Chas. Baptist	Waterloo	3.30	632	James Davis	Neptune	3.64
547	M. Joice	Waterloo	3.13	633	H. Butts	Neptune	3.98
548	H. Bolter	Waterloo	3.46	634	Thomas Sippy.	Neptune	3.87
549	August Gordon	Waterloo	3.63	635	E. Holt	Neptune	3.75
550	John Paul	Waterloo	3.35	636	Chris. Holtz	Neptune	3.28
551	Robert Pearsal	Waterloo	3.68	637	A. Lincoln	Neptune	3.75
552	E. Feibger	Waterloo	3.79	638	L. Grasman	Neptune	2.97
553	H. Kickbine	Waterloo	4.04	639	John Sippy	Neptune	3.28
554	A. Dalman.	Waterloo	3.71	640	A. Hamilton	Neptune	3.64
555	F. Pribbenow	Waterloo	3.00	641	C. E. Jacquish.	Neptune	2.46
556	John White	Waterloo	3.46	642	J. Canaan	Neptune	3.52
557	A. Heck	Waterloo	3.54	643	D. Gwin	Neptune	3.55
558	G. Ghastin	Waterloo	3.72	644	J. Davis	Neptune	3.64
559	Frank Skotizky	Waterloo	3.30	646	John Connell	Waukesha	3.05
560	Geo. Weckest	Waterloo	3.21	647	Fred Smears	Waukesha	3.17
561	Gus. Weeks	Waterloo	3.46	648	D. Newhall	Waukesha	3.10
562	V. Simon	Waterloo	3.21	649	Jud Hart	Waukesha	3.99
563	Chas. Mickel	Waterloo	3.12	650	W. Nickel	Waukesha	4.34
564	E. Bartosh	Waterloo	3.21	651	W. Dixon	Waukesha	4.38
565	H. Hyer	Waterloo	3.01	652	J. Lehrerer	Waukesha	3.75
566	C. Milkey	Waterloo	3.63	653	E. Butler	Waukesha	3.28
571	W. Cebell	London	3.42	657	F. Opitz	Saukville	3.75
572	A. Goetschalk.	London	3.54	658	Rich Opitz	Saukville	3.75
573	W. Lebinew	London	2.99	659	C. Sanders	Saukville	3.52
574	J. Macker	Loudon	3.30	660	F. Zimner	Saukville	3.75
575	F Roehl	London	3.36	661	M. Leonertz	Saukville	4.22
576	C. Rohlman	London	3.54	662	Aug. Krueger.	Saukville	3.99
577	G. Puhel.	London	3.50	663	W. Arndt	Saukville	3.87
578	J. Meindorf	London	3.52	664	F. Schmidtz	Saukville	3.64
579	E. Wolf	London	3.31	665	D. Schraeder	Saukville	3.52
580	G. Christanson.	London	3.34	666	F. Schraeder	Saukville	3.75
581	H. Mackales	London	3.50	667	G. Boettcher	Saukville	3.99
582	C. Cufol	London	3.43	668	F. Pape	Saukville	3.28
583	E. Webber	London	3.50	669	F. Irwin	Saukville	3.64
584	F. Puncel	London	3.36	670	John Feltes	Saukville	4.22
585	F. Heine	London	3.35	671	W. Dickman	Saukville	3.28
586	H. Tory	London	3.99	672	M. Denerath	Saukville	3.99
587	C. Rohl	London	4.00	673	Mrs. M. Roden.	Saukville	3.52
588	A. Webber	London	3.56	674	H. Johnson	Saukville	3.87
589	C. Frei	London	3.51	675	C. Shober	Saukville	3.99
590	A. Britzke	London	3.52	676	J. Sabish	Saukville	3.87
591	P. Faltsac	Waterloo	3.89	677	C. Becker	Saukville	3.99
592	H. Kreuger	Waterloo	3 77	678	Mat Hann	Saukville	4.10
593	A. D. Rice	Waterloo	3.51	679	Mrs. M. Fran	Saukville	3.40
594	H. Swanke	Waterloo	3.31	680	L. Wambold	Saukville	3.64

ANALYSIS OF MILK.—Continued.

Lab. No.	From whom taken.	Address.	Butter fat.
681	Frank Bell....	Saukville.....	3.75
682	J. Kronenburg.	Saukville....	3.75
683	John Dries....	Saukville.....	3.99
684	John Schuh ...	Saukville.....	3.17
685	D. Wilchen ...	Saukville.....	3.40
686	John Kurtz ...	Saukville.....	3.87
687	Joseph Nickel.	Saukville.....	3.64
688	John Turck....	Saukville. ...	3.75
689	John Boodle...	Saukville.....	3.52
690	Sam. Johnson.	Saukville.....	3.28
691	A. Jacobson ...	Saukville.....	4.11
692	N. Jacobson..	Saukville. ...	3.64
693	J. W. Lutfring.	Saukville....	3.69
694	J. Nierren	Saukville.....	3.87
695	John Reiter....	Saukville. ...	3.90
696	J. Bartschigar.	Saukville.....	3.05
697	Wm. Lubahn..	Saukville....	4.22
698	Mrs. M. Schwartz	Saukville.. ..	3.52
699	N. Brauschalt..	Saukville.....	4.11
700	W. Schrader...	Saukville. ...	4.11
701	N. Gottland ...	Saukville....	3.64
702	C. H. Nierren.	Saukville.....	3.65
703	H. Whalen....	Saukville.....	4.11
704	H. Opitz	Saukville... .	4.
705	Geo. Geiss .	Saukville. ...	3.9
706	B. F. Dewey...	Spring Green.	3.58
707	E. B. Evans ...	Spring Green.	3.52
708	A. Frederickson	Spring Green.	3.63
709	John Davis ...	Spring Green.	3.64
710	Dan Morgan...	Spring Green.	3.75
711	Jacob Witzel..	Spring Green.	4.00
712	James Lins...	Spring Green.	3.75
713	Geo. Dewey...	Spring Green.	3.87
714	John Lins	Spring Green.	3.87
715	Martin Nelson.	Spring Green.	4.32
716	Jacob Seiders.	Spring Green.	4.34
717	Chas Sherwood	Spring Green.	3.44
718	W. H. Harris..	Spring Green.	3.93
719	Thos. Loverse .	Spring Green.	3.44
725	Geo. Dillwig...	Branch	4.20
726	C. Clemme. ...	Branch.......	3.80
727	F. Schmatz ...	Branch.......	3.80
728	K. Rollson...	Branch.......	3.60
729	Geo. Misenest .	Branch.......	4.20
730	W. Brunnig....	Branch	4.40
731	F. Rank	Branch	4.80
732	H. Larenzen...	Branch ...	3.85
733	— Springstube.	Branch	3.40
734	J. Squirol......	Branch	4.60
735	D. Sheldon.....	Branch	4.20
736	Geo. Needle. ..	Branch	3.80
737	J. A. Stepek...	Branch	4.60
738	A. Veolker .. .	Branch	5.20
739	J. Zepperer ...	Branch	4.00
740	N. Zepperer ...	Branch	4.00
741	G. Zepperer ...	Branch	4.60
742	A. Bry.........	Branch	3.80
743	M. Baumman..	Branch	3.85
744	F. Jana.... ..	Branch	3.40
745	— Niespodiany	Branch	3.00
746	F. Merthens ...	Branch	4.60
747	J. Merthens...	Branch	4.40
748	R. Halverson..	Branch	3.80
749	W. Brunnor...	Branch	3.60
750	— Larson......	Branch	3.40
751	M. Albrechet..	Branch	4.00
752	S. Olson........	Branch	3.60
753	K. Johnson ...	Branch	4.40
754	J. Scheisel.	Branch	4.20
755	H. Plockelman.	Branch	3.40
756	J. Simmet....	Branch	4.60
757	A. Kerner......	Branch	4.80
758	G. Wellner ...	Brahch	4.20
759	J. Bauman	Branch	4.40
760	H. Halverson..	Branch	3 40
761	Geo. Slatky ...	Francis Creek	2.60
762	J. Harkley. ...	Francis Creek	3.60
763	J. Fakora......	Francis Creek	3.90
764	J. L. Fakora...	Francis Creek	3.00
765	M. Swetlek . ..	Francis Creek	3.60
766	J. Cicek........	Francis Creek	4.00
767	J. Kelner	Francis Creek	3.60
768	P. Rade.	Francis Creek	3.00
769	P. Warel . . .	Francis Creek	3.00
770	W. Popelars...	Francis Creek	3.20
771	J. Swetlek.....	Francis Creek	3.20
772	N. Swetlek	Francis Creek	3 90
773	J. Cisler.	Francis Creek	4.00
774	J. Slalky.......	Francis Creek	3.20
775	T. Kurkle	Francis Creek	4.60
776	W. Slatky	Francis Creek	3.00
777	W. Buric	Francis Creek	3.60
778	C. Pilger..... .	Francis Creek	3.60
779	A. Ccek	Francis Creek	3.20
780	M. Ourava.....	Francis Creek	3.40
781	F. Wid	Francis Creek	3.60
782	J. Pich.........	Francis Creek	3.00
783	M. Pich	Francis Creek	3.60
784	F. Stiber.......	Francis Creek	3.40
785	A. Hayer.......	Cato..........	3.20
786	J. Brodka... ..	Cato..	4.00
787	A. Tritsch	Cato.....	3.80
788	J. Munhall....	Cato..........	4.00
789	J. Piper.	Cato..........	4.00
700	J Mayerl......	Cato...	3.80
791	G. Rigling.....	Cato..........	3.80
792	F. Maney......	Cato..	3.80
793	J. Redden	Cato..........	3.40
794	M. Redden.....	Cato..........	4.20
795	C. Stroehfeld..	Cato..........	2.80
796	W. Menneek ...	Cato....	3.00
797	C. McCourt....	Cato..........	3.80
798	F. Brandice ...	Cato...... ...	4.20
799	O. S. Piper	Cato.........	4.00
800	W .Brier.......	Cato....	3.60
801	P. Laughlan....	Cato.	3.80
802	S. French......	Cato.........	4.00
803	M. Colbeck ...	Cato...... ...	4.00
804	C. Krohm.. ...	Cato :........	4.20
805	H. Neoman....	Cato..........	3.60

SUMMARY OF MILK.

408 samples of milk tested.

384 samples contained more than 3 per cent. of butter fat.

235 samples contained more than 3.5 per cent. of butter fat.

107 samples contained more than 4 per cent. of butter fat.

24 samples contained less than 3 per cent. of butter fat.

These samples represent very fairly the quality of milk supplied to creameries and cheese factories, as well as that sold to individuals in the larger cities of the state.

Although these 408 samples represent a very small portion of the milk supply of Wisconsin, yet, the wide distribution of the samples, and the varying conditions under which they were taken, enable us to form some idea as to the quality of Wisconsin milk, and likewise to judge if the standard required by law is a just one from the producers' standpoint. The present standard in Wisconsin requires at least three per cent. of butter fat to be present in all milk offered for sale. This standard is adopted from a careful consideration of the composition of milk produced under all conditions of age, breed, and feed. The standard represents not the average composition of milk but is intended to represent the quality of milk produced by the poorest animals under normal conditions of feed and health. The milk standard is a very important question to both the milk producer and consumer. Too high a standard would be injurious to the producer, as it would require him to keep a particular breed of cows that his product should meet the requirements of the law. Too low a standard would be unjust to the consumer, as it would be an incentive to the breeding of animals giving large quantities of low grade milk. The reason for the existence of low grade and adulterated milk lies in the fact that milk is one of the few articles of food of whose quality the consumer cannot judge by examination. The presence or absence of cream is the only test possessed by the consumer, and that is of but little value when applied to milk which has been transported any distance.

If milk has been diluted in any way and it still contains there per cent. of butter fat, the person who dilutes and delivers it to a customer or a factory has violated the law.

BAKING POWDER.

The use of baking powders as a substitute for yeast in the aeration of bread is comparatively modern. These powders are composed of bicarbonate of soda with the addition of one or more of the following chemicals: Cream of tartar, tartaric acid, alum, and acid phosphate of lime, the object being the production of carbonic acid gas. When this powder is mixed with the flour and water added to make dough, the chemicals are dissolved and the carbonic acid set free. The salt resulting from the chemical action remains in the bread and is eaten with it. This process is an imitation of the method of making bread with sour milk and saleratus, only in place of the lactic acid of the sour milk, cream of tartar, alum, or acid phosphate is used. The use of these bread preparations has given rise to a large and growing industry. The amount consumed in the United States is estimated at from fifty to seventy-five million pounds per year, having a value of from twenty to twenty-five million dollars.

There is no recognized standard composition of baking powders; provided the manufacturer does not use any substance injurious to health, his choice as to chemicals is not limited. Fortunately the list of chemicals that can be used for that purpose is small. The requirements of cheapness and palatability confine the manufacturers to the following list: Cream of tartar, tartaric acid, alum, acid phosphate of lime. One or more of the above mixed in the proper proportions with bicarbonate of soda and starch constitutes the baking powder found on the market at the present time.

All powders on the market may be classed under one of the following heads:

1st. Tartaric powders, in which the acid is tartaric acid or cream of tartar.

2nd. Phosphate powders, in which the tartaric acid is replaced by acid phosphate of lime.

3rd. Alum powders, in which the acid is sulphuric acid. All powders sold come under one of these three heads, but powders are sold containing one or all of the above constituents. The objections which may be made to the use of baking powders are due to the residue left in the bread. Baking powder manufacturers foster the idea that nothing remains in the bread but that everything is driven off during baking. On the contrary there is a residue equal in weight to the baking powder used, and its amount and character determines the healthfulness of the combination used.

In the case of a cream of tartar powder the products are carbonic acid and a double tartrate of potassium and sodium, known as Rochelle salt. This is one of the mildest salts used in medicine. The National Dispensatory says: "In doses of one-half to one ounce (240 to 480 grains) it acts as a gentle and cooling laxative and seldom disagrees with the stomach." The cream of tartar is a natural constituent of the grape and is open to less objection than any other material except it be the acid phosphates. It is well, however, to consider how much of even this mild salt we consume in a loaf of bread. The directions that accompany the powder usually direct two teaspoonsful to be used for each quart of flour. If the powder is fresh this is enough, but if an old powder is used, three and even four teaspoonsful must be used if the bread is to be light. In the case of a fresh powder, making allowances for the 20 per cent. of filling, there would remain 165 grains of crystallized Rochelle salt in the bread made from one quart of flour. This residue is of such a mild and neutral character that the most delicate stomach could probably take the amount left in the bread, without harm. But it is well to remember that a loaf of bread made according to directions contains more of Rochelle salts than is found in a Sedlitz powder. The acid phosphate of lime is largely used in baking powders, and there would seem to be no objection to its use if the salt is pure. It is made by acting upon ground bones with sulphuric acid. The result is insoluble sulphate of lime and acid phosphate of lime. If this latter is carefully purified there is no objection to its use in baking powders; but as the sulphates of lime are difficult to remove, most phosphate powders contain this impurity. Also if commercial sulphuric acid is used to decompose the bones notable quantities of lead and arsenic may be introduced into the baking powder. If the acid phosphate is pure there is no objection to its use in baking powders. The result of the decomposition of a phosphate powder is soluble phosphate of soda and insoluble phosphate of lime. The U. S. Dispensatory states: "Phosphate of soda is mildly purgative in doses of from one to two ounces. Its physiological action is therefore comparatively slight. Phosphates of calcium are probably neutral so far as their direct action on the stomach is concerned. The makers of phosphate powders claim that the use of such powders restores the phosphoric acid present in the wheat, which is largely removed in the preparation of flour. It is doubtful if this claim can have any weight, as the supply of phosphates is more than made up in other foods.

Sesqui carbonate of ammonia has been used to some extent, and one of the most widely advertised brands of baking powders contains a small quantity of it. It is a compound which should be used with great caution. The ammonia salts are much more irritating than the corresponding potash or soda salts. The National Dispensatory says of carbonate of ammonia: "It is irritant, and if long continued, even in doses which the stomach will tolerate, it impairs nutrition. In doses of five to ten grains, it increases the fullness and force of the pulse and causes a sense of lightness in the head. It is one of our most powerful medicines, and certainly should not be used in the preparation of foods."

ALUM BAKING POWDER.

The call for a cheap baking powder has caused the powders made with alum to come into extensive use. The healthfulness of these alum powders is seriously questioned, and several careful investigations have been made, bearing on this point. It is universally conceded that alum itself, when added to bread, is injurious to health, and that the small amount sometimes added to flour to improve the appearance of the bread made from it, should be decidedly prohibited. Since the introduction of baking powders made from alum and bicarbonate of soda, there has been much dispute as to the actual healthfulness of the residue left in the bread made with such powders. The alum used in these powders is what is known as ammonia alum, and is a double sulphate of ammonia and aluminum. This salt when mixed with bicarbonate of soda in the proper proportions, is decomposed and carbonic acid, sulphates of soda and ammonia, together with hydrate of alumina are formed. This residue is more complex than with any of the powders previously described. There is but little known of the physiological action of sulphate of ammonia; but it is probable that it possesses the same irritating qualities of the other ammonia salts. Sulphate of soda is the well-known Glaubers salts and its action as a purgative is well-known. The question is further complicated by the fact that some powders contain tartaric acid or acid phosphate of lime in addition to the alum. These powders give an entirely different residue from the straight alum powders. The addition of tartaric powders is decidedly objectionable. If the acic is added in sufficient quantity to a straight alum powder, it prevents the formation of the insoluble hydrate of alumina when the powder is moistened, and the effect would be the same as if alum or other soluble salt of aluminum were taken into the stomach.

The use of acid phosphate of lime in place of tartaric acid is a decided improvement. The residue from an alum phosphate powder is a mixture of phosphate of aluminum, sulphate of lime, sulphate of aluminum, sulphate of soda. There is no doubt that the soluble salts of aluminum are injurious when taken into the stomach.

Of the physiological action of the hydrate and phosphate of aluminum there has been much doubt, but the recent investigations of Prof. J. W. Mallet would indicate that although hydrate of alumina is an insoluble substance, yet it may have a decided action on the process of digestion. From a long series of experiments with alum powders and their residues, Prof. Mallet draws the following conclusions: (a) The greater part of the alum baking powders in the American market is made with alum, the acid phosphate of calcium, bicarbonate of sodium and starch; (b) These powders as found in the retail trade, give off very different proportions of carbonic acid gas and therefore require to be used in different proportions with the same quantity of flour; some of the inferior powders in largely increased amount to produce the required porosity in bread.

(c) In these powders there is generally present an excess of the alkaline ingredient, but this excess varies in amount and there is sometimes found an excess of acid material.

(d) On moistening with water these powders, even when containing an excess of alkaline material, yield small quantities of aluminum and calcium in a soluble condition.

(e) As a consequence of the common employment of calcium acid phosphate with alum, in the manufacture of baking powders, these, after use in bread-making, leave most of their aluminum in the form of phosphate. When alum alone is used, the phosphate is replaced by hydroxide.

(f) The temperature to which the interior of bread is exposed in baking does not exceed 212° F.

(g) At the temperature of 212° F., neither the "water of combination" of aluminum hydroxide nor the whole of the associated water of either this or the phosphate, is removed in baking bread containing these substances.

(h) In doses not very greatly exceeding such quantities as may be derived from bread as commonly used, aluminum hydroxide and phosphate produce, or produced in experiments upon myself, an inhibitory effect upon gastric digestion.

(i) This effect is probably a consequence of the fact that a part of the aluminum unites with the acid of the gastric juice and is taken up into solution, while at the same time the remainder of the aluminum, hydroxide or phosphate throws down in insoluble form the organic substance constituting the peptic ferment.

(k) Partial precipitation in insoluble form of some of the organic matter of food may also be brought about by the presence of the aluminum compounds in question.

(l) From the general nature of the results obtained the conclusion may fairly be deduced that not only alum itself but the residue which its use in baking powder leaves in bread, cannot be viewed as harmless, but must be ranked as objectionable, and should be avoided when the object aimed at is the production of wholesome bread.

The results of Mallet's experiments would indicate that the residues in bread made from alum baking powders have a decided effect even on a strong and healthy stomach. The weight of testimony is certainly against the use of alum, but the data are not yet sufficient to absolutely prohibit its use.

The following table shows the brands which have been examined and gives a good idea of the kind and quality of powders sold in the state. It will be noticed that there is a great variation in the per cent. of carbonic acid present, and consequently in the leavening power of the different powders. Some of the brands would be dear at one-fourth of the price at which they are sold.

ANALYSIS OF BAKING POWDER.

Lab. No.	Name of Dealer.	Address.	Name of Manufacturer.	Address.	Trade Mark.	Contains.	Per ct.	Other Ingredients.
30	Roundy, Peckham & Co.	Milwaukee	C. E. Andrews & Co	Milwaukee		Carbonic acid	12.9	Cream tartar, starch.
31	Roundy, Peckham & Co.	Milwaukee	Not known			Carbonic acid	9.5	Alum.
32			Jewett, Sherman Co	Milwaukee		Carbonic acid	11.6	Cream tartar.
33	Sanders & Verplank	Milwaukee	Not known			Carbonic acid	10.8	Cream tartar.
34	Bandew & Heath.	Milwaukee	Not known			Carbonic acid	11.3	Alum.
35	J. G. Flint	Milwaukee	Not known			Carbonic acid	11.2	Cream tartar.
36	J. G. Flint	Milwaukee	Not known			Carbonic acid	8.	Alum.
37	H. Scheftels & Son	Milwaukee	Thompson & Taylor	Chicago		Carbonic acid	9.34	Alum, phosphate.
38	Cromby, Smith & Co.	Milwaukee	Not known		Red Cross	Carbonic acid	9.53	Cream tartar.
39			Jewett, Sherman & Co.	Milwaukee	King	Carbonic acid	13.	Alum.
40	Banden & Heath.	Milwaukee	Not known		Cream Foam	Carbonic acid	11.4	Cream tartar.
41			Jewett, Sherman & Co	Milwaukee	White Lilly	Carbonic acid	13.35	Starch, alum, tartaric acid.
42	E. A. Smith	Milwaukee	Not known		Cupid	Carbonic acid	10.85	Starch, alum, phosphate.
43	Jewett, Sherman & Co.	Milwaukee	C. E. Andrews & Co	Milwaukee	Ladies	Carbonic acid	9.	Starch, alum.
44	Cromby, Smith & Co.	Milwaukee	Not known		Gold Seal	Carbonic acid	10 35	Starch, alum, phosphate.
45	J. G. Flint	Milwaukee	Not known		White Rose	Carbonic acid	7 55	Starch, alum, phosphate.
204	Ferris & Alvord	Whitewater	Sent by C. R. Beach	Whitewater		Carbonic acid	9.55	Cream tartar.
341	James Hanson	Racine	Spencer Blueing Paddle Co.	Chicago	Echo	Carbonic acid	5.55	Starch, alum, phosphate.
342	I. L. Esson	Racine	Spencer Blueing Paddle Co	Chicago	Eassons	Carbonic acid	3.50	Starch, alum, phosphate.
343	A. O. Burch	Racine	L. E. Taylor	Chicago	Excelsior	Carbonic acid	.9	Cream tartar, starch, alum
344	E. H. Brill	Racine	J. Wellauer	Milwaukee	White Flake	Carbonic acid	2.2	Alum.
345	James Hanson	Racine	Royal Bk. P. Co.	New York	Royal	Carbonic acid	12.8	Cream tartar.
346	Wickham & Williams	Racine	Craig B. P. Co	Cleveland, Ohio	Empire	Carbonic acid	6.5	Starch, alum, phosphate.
347	James Hanson	Racine	Rumford Chemical Works	Providence, R. I.	Hosfords	Carbonic acid	13.95	Phosphate.

348	James Hanson ...	Racine........	Zipp & Chorndorfer	Cleveland, Ohio	Zipps Grape Crystal.......... ..	Carbonic acid	9.2	Starch, alum, phosphate.
349	Hanley Bros......	Racine........	Chapman & Smith	Chicago	Chicago Yeast Powder........	Carbonic acid	10.50	Starch, alum, phosphate.
350	Schacht Bros.....	Racine........	Durham Coffee & Spice Co.......	La Fayette, Ind.	Winner...	Carbonic acid	10.7	Starch, alum, phosphate.
351	James Hanson...	Racine........	Vonwie Bros	Cleveland & Chicago	Forest City..... .	Carbonic acid	8.65	Starch, alum.
352	Grand Union Tea Co.	Racine.......	Acme B. P. Co...	New York....	Acme......... ...	Carbonic acid	10.45	Cream tartar, starch, alum.
353	I. L. Easson......	Racine........	Concordia B. P. Co	Milwaukee....	Lulu.......	Carbonic acid	5.50	Starch, alum.
354	I. L. Easson......	Racine........	Prices B. P. Co...	New York....	Prices	Carbonic acid	11.25	Cream tartar, starch.
355	Wickham & Williams...........	Racine........	Shaw & Thomas..	New York....	Silver King..	Carbonic acid	7.65	Starch, alum, phosphate.
356	James Hanson...	Racine........	Wolfe & Schmetz.	Chicago	Grape	Carbonic acid	9.25	Starch, alum, phosphate.
357	A. O. Burch......	Racine.......	Bengal Coffee & Spice Co	Chicago	Snowball	Carbonic acid	11.60	Alum, phosphate, starch.
358	Wickham & Williams...........	Racine........	Geo. P. Vasbrinkt	Chicago	Vasbrinkt.	Carbonic acid	10.35	Alum, phosphate, starch.
359	Hanley Bros......	Racine...... .	Queen City Chemical Co..........	Buffalo, N. Y.	Oriole............	Carbonic acid	8.95	Alum, phosphate, starch.
360	Wickham & Williams	Racine.......	Jewett, Sherman & Co...........	Milwaukee....	Good as Gold. ...	Carbonic acid	7.15	Alum, starch.
361	Schacht Bros.....	Racine.......	J. C. Grant B.P.Co	Chicago	Hotel	Carbonic acid	7.15	Alum, starch.
362	Schacht Bros. ...	Racine........	Superior B. P. Co.	Milwaukee....	Morning Lily.....	Carbonic acid	9.40	Alum, starch.
363	Wickham & Williams........ ...	Racine........	Jewett, Sheman & Co..............	Milwaukee....	Kahala	Carbonic acid	11.1	Alum, starch.
364	G. A. Robbins ...	Sheboyg'n Fls	Barton B. P. Co..	Fairport, N. Y	....	Carbonic acid	9.9	Alum, phosphate, starch.
365	....	....	John Davis & Co..	Detroit, Mich.	New Era........	Carbonic acid	10.35	Alum, phosphate, starch.
367	Otto Lontz	Marinette.....	John Davis & Co..	Detroit, Mich.	New Era..	Carbonic acid	10.6	Alum, phosphate, starch.
368	Otto Lontz	Marinette ...	J. P. Dieter......	Chillicothe, O.	Crown King.. ...	Carbonic acid	10.55	Alnm, phosphate, starch.
369	Otto Lontz	Marinette....	White Rose B. P Co..............	Green Bay....	White Rose.......	Carbonic acid	8.25	Alum, phosphate, starch.
370	C. Rienke..... ..	Marinette.....	De Land Co.......	New York ...	Gilt Edge....... .	Carbonic acid	7.80	Alum, cream tartar, phosphate, starch.
374	J. A. McDonald...	La Crosse.. ..	Potter, Parlin & Co	Cincinnati, O.	Kenton	Carbonic acid	8.05	Alum, phosphate, starch.
375	J. A. McDonald...	La Crosse...	La Crosse Spice Mills........ ...	La Crosse.....	Badger	Carbonic acid	3.4	Alum, starch.
376	J. A. McDonald...	La Crosse.....	J. J. Hogan.......	La Crosse.....	Princess..........	Carbonic acid	3.20	Alum, phosphate, starch.
377	W. W. Taylor.....	La Crosse.....	Granger & Co.....	Buffalo, N. Y.	Safe	Carbonic acid	5.95	Alum, phosphate, starch.
378	W. W. Taylor.. ..	La Crosse.....	Rosewater Bros...	Cleveland, O..	O. K..............	Carbonic acid	6.25	Alum, phosphate, starch.
379	E. A. Wilson......	La Crosse. ...	Columbia B. P. Co	Chicago	Columbia...	Carbonic acid	3.3	Alum, phosphate, starch.
380	E. A. Wilson......	La Crosse.....	M Kalbsflaeischs..	New York ...	Wheat....	Carbonic acid	2.4	Phosphate.
381	J. J. Berghoust...	La Crosse.....	Boston B. P. Co..	Fairport, N. Y	Boston	Carbonic acid	3.45	Alum, phosphate, starch.
382	J. J. Berghoust...	La Crosse.....	John Davis & Co.	Detroit, Mich.	Coral	Carbonic acid	4.85	Alum, phosphate, starch.
416	R. Chase..........	Madison	De Land & Co....	Fairport, N. Y	Pride of Madison.	Carbonic acid	10.7	Alum, phosphate, starch.

ANALYSIS OF BAKING POWDERS.

Lab. No.	Name of Dealer.	Address.	Name of Manufacturer.	Address.	Trade Mark.	Contains.	Per. ct.	Other Ingredients.
417	W. T. McConnell & Son	Madison	Sherman Bros	Chicago	Fidelity	Carbonic acid	9.4	Alum, phosphate.
420	A. Mayers	Madison	Globe B. P. Co.	New York	Globe	Carbonic acid	8.7	Alum, phosphate, starch.
421	A. Mayers	Madison	Sprague, Warner & Co	Chicago	Unrivaled.	Carbonic acid	4.85	Alum, phosphate, starch.
425	H. G. Chase	Platteville	Excelsior Mills	Chicago	Magic Crystal	Carbonic acid	10.35	Alum, phosphate, starch.
426	Frank Schanbow	Platteville	E. Camby.	Dayton, O	Silver Star	Carbonic acid	10.2	Alum, phosphate, starch.
427	R. J. Huntington	Platteville	McNeil & Higings		New Chicago	Carbonic acid	7.2	Alum, starch.
428	John Woodward	Platteville	Bruce B. P. Co.	Chicago	Bruce's	Carbonic acid	3.7	Alum, phosphate, starch.
429	John Woodward	Platteville	A. B. Gates & Co.	Indianapolis	Crystal	Carbonic acid	10.2	Alum, phosphate, starch.
430	John Woodward	Platteville	Sprague, Warner & Co	Chicago	Improved	Carbonic acid	10.3	Alum, phosphate, starch.
431	John Woodward	Platteville	United B. P. Co.	Milwaukee	Ladies'	Carbonic acid	7.50	Alum, starch.
488	Van Akin, agent		De Land	Fairport, N. Y	De Land Chem	Carbonic acid	16.4	Cream tartar.
489	Van Akin, agent		Barton B. P. Co.	Fairport, N. Y	Barton	Carbonic acid	2.75	Alum, phosphate, starch.
490	Van Akin, agent		De Land	Fairport, N. Y	De Land Chem., 3 years old	Carbonic acid	12.3	Cream tartar.
527	W. Fulton	Portage	Not known		Fulton's Choice	Carbonic acid	12.1	Alum, phosphate, starch.

SUMMARY OF BAKING POWDERS.

Number of samples analyzed, 70.

Number of samples of cream of tartar baking powders, 7.

Number of samples containing substitutes of lower cost and poorer quality, 63.

A baking powder that contains less than 10 per cent. of carbonic acid is an inferior article in bread-baking. Acid phosphate and starch are not injurious ingredients. A glance at the foregoing table reveals the large percentage of baking powders that are comparatively worthless. One hundred of the most prominent physicians in this state do not hesitate to pronounce alum pernicious in baking powder. A purchaser should have the guarantee of the dealer that no injurious ingredients are to be found, and that the powder has not been so compounded that its leavening power has been impaired or destroyed.

VINEGAR.

Vinegar is dilute acetic acid containing a varying quantity of organic matter according to its method of manufacture. It has been known from very early times and is probably coeval with wine. It is mentioned in the most ancient literature. Moses mentions it, and Hippocrates used it in medicine. Its ability to dissolve carbonates was made use of in the earliest times. Cleopatra made use of this property in dissolving pearls and by drinking the solution won her wager of being able to consume the value of one million sesterces at one meal. It is stated also that with it Hannibal dissolved the rocks impeding his march across the Alps. Although vinegar was in general use and was early manufactured, but little was known about its formation. The alchemist Gerber, who lived in the eighth century, first discovered that vinegar could be made stronger by distillation. Valentinus in the fifteenth century knew that by slow distillation of vinegar, first a weak product, then a stronger one is obtained. Stahl and others in the eleventh century produced acetic acid from acetate of copper. Stahl and Westendorf were the first to prepare the acid in a pure state. The dry distillation of wood was known to produce an acid body but it was supposed to be a peculiar acid, and it was not till 1800 that Fourcroy and Vauquelin recognized this acid as acetic acid. It was not until the nineteenth century that the chemical constitution of acetic acid and its relation to alcohol was known. In 1822 Döbereiner discovered that acetic acid was produced from alcohol.

The manufacture of vinegar consists in the fermentation of organic fluids containing alcohol or sugar. Fermentation is a series of decompositions by which the sugar of a liquid is first broken up into alcohol and carbonic acid, with the formation of other compounds in small quantities; and, second, breaking up the alcohol into acetic acid and water. The changes which take place during fermentation are caused by agents called ferments. The organisms producing fermentation are named after certain products which they form in larger quantities. That found in vinous fermentation consists of low forms of vegetable growth called *torula* or *saccharomyces*. They are globular or cell shaped in form and multiply by budding. This fermentation is the first that occurs in the process of making vinegar. After the first or alcoholic fermentation is over, a second fermentation commences, resulting in the decomposition of alcohol into acetic acid and water. The ferment which causes this change is a micro organism known as mycoderma acetic. It is widely distributed through the atmosphere, and develops upon the surface of liquid as a thick white skin. Under the microscope this skin is seen to consist of numerous small cells or collection of cells having the general form of the figure eight.

In a more advanced stage of the fermentation they appear as chains and strings of beads. In many of the cells oval forms, slightly contracted, appear. This contraction becomes more marked and the cell finally splits into two new cells. These cells only live for a short time and then sink to the bottom of the liquid and become dormant. In this condition they may remain a long time without destruction. When these dormant cells or germs are placed on the surface of a fresh liquid and kept at a proper temperature the development of the ferment again begins and continues with great rapidity.

Duclaux says: "These little beings reproduce themselves with such rapidity that by placing an inperceptible germ upon the surface of a liquid contained in a vat having a surface of one square meter (about one square yard), we may see it covered in from twenty-four to forty-eight hours with a uniform velvety veil. If we suppose that there are three thousand cells in a square millimeter, this will give us for the vat three hundred millions of cells produced in a very short time."

As the result of many experiments, the conditions most favorable for the production of the vinegar ferment and the conversion of the largest quantity of alcohol into acetic acid are well known. These are:

1. A fluid which, besides alcohol and water, contains nitrogenous bodies and alkaline salts. The quantities of these must, however, not exceed a certain limit.

2. The fluid must be in immediate contact with the air.

3. The temperature of the fluid and the air surrounding it must be within certain limits (68°–95° F.) The substances used for the manufacture of vinegar are quite numerous. All wines and fruit juices, molasses, beer, solution of glucose, and in fact any fluid containing fermentable sugars. The methods employed in the various processes of manufacturing vinegar belong to one of two classes, the old process of self fermentation, and the new or quick process.

Depending on the material used, many slight modifications are introduced into the old process, the resulting vinegar showing quite different qualities as regards odor and flavor.

Vinegar obtained from dilute alcohol will show a difference in odor depending on the material used in the preparation of the specific alcohol.

Potato alcohol always contains fusel oil and in the oxidation of the alcohol by the vinegar ferment, this oil is oxidized, giving characteristic flavor to the vinegar. Vinegar prepared from wine, fruit, beer and glucose also possesses definite properties as regards odor, flavor, etc.

In preparing vinegar by the old process the first step is the alcoholic fermentation. In case of cider the juice is allowed to stand in casks until it has undergone alcoholic fermentation, and active fermentation has stopped. In most cases it is then racked off into other casks and left exposed to the air till sufficient acidity has developed to render it suitable for use. The above is a long, slow process, several months being required for the preparation of the finished article it being a well-known fact that the vinegar ferment required free access of air. Schützenbach in 1823, conceived the idea that if he greatly enlarged the surface which was exposed to the air, the process of acetification would be greatly hastened. His experinents were successful, and the so-called "quick process" was soon adopted. The process consists in allowing alcoholic liquid to trickle slowly through beechwood shavings packed into a cylindrical tower, so arranged as to allow a current of air to pass through it. This arrangement presents in a high degree all the conditions required for the formation of vinegar. The vinegar ferment being spread evenly on the surface of the shavings enables the process to take place simultaneously on many thousands of square feet, instead of the limited area of the tank as in the old process. The term quick process is very appropriate; it differs from the old process only in the time required for its execution, the chemical changes being the same in both cases. In carrying on the quick process, each manufacturer introduces slight modifications suggested by his experience or convenience, but the following description will give a general idea of the process.

Cider Vinegar.—The cider is put in large store vats and left quiet until the vinous fermentation has taken place. It is then what would be called hard cider and contains alcohol and some acetic acid. It is then known as "stock." When the stock is ready for the generator it is pumped into the filter. This may be of sand, sawdust or other filtering material, its object being to remove any sediment or floating organic matter which would otherwise clog the converters. From the filters it runs into the generators. The liquid is run through a screen at the top of the generator to break it up into drops and distribute the liquid evenly over the surface of the shavings. The generator consists of a round tank of wood six to ten feet high, with a diameter of 35 inches at the top, and 45 inches at the bottom, thus giving it the form of a truncated cone. The generator is divided into three parts one above the other; the upper one containing a screen to distribute the alcoholic liquor; the center one containing beech shavings, and the lower one serves for the collection of the vinegar. Air is let in by holes bored through the sides of the tank below the false bottom on which rest the beech shavings. The amount of air is regulated by wooden stoppers placed in these holes. After passing through the generator, if it contains any unconverted alcohol, the vinegar is passed through a second time, and then is finished vinegar. Many substances have been prepared for filling the generators, but at present beechwood shavings are considered the best. They are now made especially for this purpose, being cut and curled by machinery. They are prepared for the generator by being washed in water and steamed to remove the woody taste and impurities which they would otherwise give the vinegar. The shavings are dried and saturated with old vinegar and are then ready for use.

Brannt states that the surface exposed in a generator three feet by six, filled with shavings, is over 22,000 square feet.

Material for Vinegar Making.—The substances from which vinegar is made at the present time are beer, wine, glucose, alcohol, molasses, and fruit juices. Wine vinegar is chiefly used in Europe. It is made from grape juice, inferior wines and from the second and third pressings of the grapes called "lees." Wine vinegars vary in color from pale yellow to red, and have a specific gravity of from 1.014 to 1.022. Most of the vinegar used in Great Britain is derived from the fermentation of a wort made from a mixture of barley and malt. Malt vinegar is of a decided brown color, and in specific gravity varying from 1.017 to 1.019, the strongest known as proof vinegar, containing from 4.6 to 5 per cent. of acetic acid. Glucose vinegar is prepared from a mixture of glucose and water, by allowing it to undergó alcoholic fermentation, and then running it through the generator in the usual way. The vinegar sometimes contains large quantities of dextrine and sulphate of lime, left in the glucose as an impurity during the process of manufacture.

Molasses vinegar is made in the same way as glucose vinegar.

The larger part of the vinegar now on the market is made from a dilute alcohol. This vinegar as it comes from the converters is colorless as water. It is colored by the addition of burnt sugar (caramel) and sold as cider vinegar.

Characteristics of Different Vinegars.— Cider vinegar should have a yellow color and a cider-like odor. Evaporated to dryness on a water bath it leaves a dark brown residue, having a taste of burnt apples. The amount of extract is from 1.5 to 5 per cent., depending on the age of the sample and method of manufacture. Cider vinegar made by the old process contains malic acid, and on the addition of acetate of lead gives a heavy yellowish precipitate of malate of lead. The ash from cider vinegar contains considerable quantities of alkaline phosphate. The residue from wine vinegar contains the salts found in wine. It is distinguished from other vinegars by containing cream of tartar. According to the Edinburgh Pharmacopœia, it may be distinguished from malt vinegar by adding ammonia in slight excess, which causes in wine vinegar a purplish muddiness and slowly a purplish precipitate, but in malt vinegar no precipitate or only a slight one.

Spirit vinegar made from dilute alcohol should leave only a very small residue; if caramel has been added to color it the residue will be of a dark black brown and leave no ash on burning.

Beer vinegar is yellow and has an odor of sour beer. It contains as much as 6 per cent. of solids on evaporation. Beer vinegar does not contain more than 2.5 to 3 per cent. of acetic acid and requires to be fortified by the addition of a stronger vinegar. Glucose vinegar has the taste and smell of fermented grain. It usually contains considerable impurities, such as dextrine, sulphate of lime and sometimes sodium chlorides.

Adulteration of Vinegar.— Blythe classifies the adulteration of vinegar as follows:

1, Water; 2, mineral acids, usually sulphuric, rarely hydrochloric or nitric; 3, metallic adulterations; or, more properly, impurities as they are introduced from the apparatus. There are arsenic, derived from the sulphuric acid; copper, lead, zinc and tin from the solvent action of the acetic acid on any metallic surfaces with which they may come in contact; 4, Pyroligneous acid; 5, various organic, such as coloring agents, capsicum, etc.

The chief adulteration is the addition of whiskey vinegar to cider vinegar, or the coloring of whiskey vinegar with caramel, and selling it for cider vinegar.

The analysis of a sample of vinegar consists in a determination of the specific gravity, the amount of acid present and total solids. The specific gravity is taken by a Westphal balance. To determine the acidity 20 c. c. are measured into a beaker, 100 c. c. of water and a few drops of phenol-phthalein (in alcoholic solution) are added, and the acid titrated with a normal alkali solution. The solids are found by evaporating 20 c. c. to dryness at 100° C. (212° F.) Thus far no free acid other than acetic or other impurities have been found in Wisconsin vinegar.

The following table gives the analyses of vinegar examined:

ANALYSES OF VINEGAR.

Lab. No.	From Whom Taken.	Address.	Name of Manufacturer.	Address.	Solids.	Acetic Acid.	Specific Gravity.	Quality.
4	D. Bryant	Madison	Not known		.51	4.96	1.005	Whiskey.
5	J. H. D. Baker	Madison	Not known		.12	4.87	1.005	Whiskey.
6	J. H. D. Baker	Madison	Not known		12.98	4.75	1.05	Glucose.
7	Gardner Snell	Madison	Not known		.71	5.18	1.008	Whiskey.
8	Gardner Snell	Madison	Not known	Madison	.46	3.06	1 006	Whiskey.
9	Welsh & Carpenter	Madison	H. Grove & Son	Madison	.23	3.81	1.005	Whiskey.
10	M. L. Nelson	Madison	Michigan Vinegar Co		2.13	3.57	1.012	Cider.
11	Correy Bros	Madison	Not known		.1	2.06	1.002	Whiskey.
12	Correy Bros	Madison	American Vinegar Co	Milwaukee	.23	4.43	1.005	Whiskey.
13	J. C. Light	Madison	American Vinegar Co	Milwaukee	.2	2.99	1.004	Whiskey.
14	J. C. Light	Madison	American Vinegar Co	Milwaukee	.23	2.86	1.003	Whiskey.
15	H. Grove & Son	Madison	Dahinden & Gallasch	Milwaukee	.32	6.50	1.006	Whiskey.
16	Milwaukee Vinegar Co	Milwaukee	Milwaukee Vinegar Co	Milwaukee	.26	6.86	1.009	Whiskey.
17	Roth Manufacturing Co	Milwaukee	Roth Manufacturing Co	Milwaukee	.1	5.41	1.004	Whiskey.
18			Reideburg & Co	Milwaukee	.101	5.20	1.01	Malt.
19			Dahinden & Gallasch	Milwaukee	3.34	2.41	1.01	Cider.
20			J. B. Liginger & Son	Milwaukee	3.81	8.02	1.017	Cider.
21			H. Riedeburg & Co	Milwaukee	.33	6.12	1.007	Whiskey.
22			Roth Manufacturing Co	Milwaukee	.12	4.46	1.003	Whiskey.
23			Dahinden & Gallasch	Milwaukee	.14	6.59	1.009	Whiskey.
24			American Vinegar Works	Milwaukee	.25	7.45	1.01	Whiskey.
25			Paul Bechtner	Milwaukee	.17	8.36	1.009	Whiskey.
26			Paul Bechtner	Milwaukee	.2	3.87	1.005	Whiskey.
27			American Vinegar Works	Milwaukee	2.34	6.60	1.015	Cider.
28			Paul Bechtner	Milwaukee	2.64	4.98	1.014	Cider.
46	Hilderbrand & Deihl	Sheboygan	Not known		.14	3.92	1.004	Whiskey.
47	John Allen	Sheboygan	Not known		3.07	2.74	1.01	Cider.
48	C. W. Nelson	Sheboygan	Not known		.46	2.87	1.004	Whiskey.
49	Cabile & Co	Sheboygan	Dahinden & Gallasch	Milwaukee	.13	3.89	1.001	Whiskey.
50	C. Neumeister & Co	Sneboygan	Manitowoc Vinegar Co	Manitowoc	.16	4.25	1.005	Whiskey.
51	Rickmein & Schmidt	Sheboygan	H. Schiftels & Son	Milwaukee	.12	3.23	1.	Whiskey.
52	J. M. Steinle	Sheboygan	Dahinden & Gallasch	Milwaukee	.08	4.36	1.004	Whiskey.
53	F. H. Hoffman & Son	Sheboygan			.21	2.83	1.003	Whiskey.
54	C. W. Nelson	Sheboygan	Reisburg & Co	Milwaukee	.16	2.97	1.003	Whiskey.
55	Rickmein & Schmidt	Sheboygan	H. Scheftels & Son	Milwaukee	.24	4.51	1.005	Whiskey.
56	Rietow Bros	Sheboygan	J. D. Imbush	Milwaukee	.08	3.58	1.003	Whiskey.
57	C. Koerner	Fond du Lac	Roth Manufacturing Co	Milwaukee	.22	5.83	1.009	Whiskey.
58	J. C. Zenter	Oshkosh	Fugleburg & Metz	Oshkosh	.11	3.83	1.004	Whiskey.

59	Chas. Foelsch	Fond du Lac	G. M. Arnold	Oshkosh	.22	3.59	1.005	Whiskey.
60			Arnold Vinegar and Yeast Co.	Oshkosh	.33	3.82	1.005	Whiskey.
61	W. J. Mason	Fond du Lac	Paul Bechtner	Milwaukee	.19	4.17	1.005	Whiskey.
62	Thomas Gough	Fond du Lac	Paul Bechtner	Milwaukee	.19	4.20	1.005	Whiskey.
63	F. Fritz	Fond du Lac	Dahinden & Gallasch	Milwaukee	.23	4.29	1.006	Whiskey.
64	Wm. Dickman	Oshkosh	American Vinegar Works	Milwaukee	.20	4.01	1.006	Whiskey.
65	J. C. Zenter	Oshkosh	Fugleburg & Metz	Oshkosh	.20	3.96	1.005	Whiskey.
66	C. Foelsch	Fond du Lac	Arnold Vinegar Co	Oshkosh	.19	3.10	1.004	Whiskey.
67			Arnold Vinegar Co	Oshkosh	.14	3.99	1.005	Whiskey.
68	E. A. Keith	Fond du Lac	H. Reideburg & Co	Milwaukee	.26	7.36	1.009	Whiskey.
69	E. H. Jones	Fond du Lac	Arnold Vinegar Co	Oshkosh	.18	3.23	1.005	Whiskey.
70	H. Wallichs	Fond du Lac	Fugleberg & Metz	Oshkosh	.18	4.08	1.005	Whiskey.
71	Mrs M Kremer	Oshkosh	Fugleberg & Metz	Oshkosh	.14	3.84	1.004	Whiskey.
72	A. R. Dandy	Oshkosh	J. E. Kennedy & Son	Oshkosh	.44	3.76	1.005	Whiskey.
73	Leonard Mayer	Oshkosh	Fugleberg & Metz	Oshkosh	3.06	3.18	1.014	Cider.
74	Leonard Mayer	Oshkosh	Fugleberg & Metz	Oshkosh	2.41	3.24	1.013	Cider.
75	E. H. Jones	Fond du Lac	G. M. Thornbul	Oshkosh	.39	3.62	1 006	Whiskey.
76	Chas. Foelsch	Fond du Lac	Arnold Vinegar Co	Oshkosh	.34	3.66	1.005	Whiskey.
77	E H. Keith	Fond du Lac	S. R. & J. C. Matt	New York	2.62	4.74	1.017	Cider.
90	Wagner & Bollinbeck	Madison	Not known		.14	7.12		Whiskey.
91	Roundy, Peckham & Co.	Milwaukee	Not known		.14	2.84		Whiskey.
92	Roundy, Peckham & Co.	Milwaukee	Not known		.16	3.41		Whiskey.
93	Roundy, Peckham & Co.	Milwaukee	Not known		.11	4.15		Whiskey.
94	Roundy, Peckham & Co.	Milwaukee	Not known		.09	3.07		Whiskey.
95	Roundy, Peckham & Co.	Milwaukee	Not known		2.04	4.07		Cider.
96	Roundy, Peckham & Co.	Milwaukee	Not known		.11	3.07		Whiskey.
97			H. C. Thom	Beloit	1.64	3.62		Cider
107	Huson & Zerler	Plymouth	Not known		.50	3.09	1.006	Whiskey.
108	Herman Kleuter	Madison	Paul Bechtner	Milwaukee	.27	4.23	1.006	Whiskey.
109	W. T. Vankirk	Janesville	Reed, Murdock & Fisher	Chicago	.89	2.84	1.008	Mixed malt and cider.
110	Ball & Bates	Janesville	W. H. Bunge	Chicago	.18	4.64	1.008	Whiskey.
111	A. P. Davis & Co	Janesville	Reed, Murdock & Fisher	Chicago	.74	4.02	1.005	Mixed malt and cider —whiskey.
112	Carlen & Wilcox	Janesville	Reed, Murdock & Fisher	Chicago	3.45	3.22	1.016	Cider.
113	F. W. Christman	Janesville	Franklin McVeigh	Chicago	1.87	3.71	1.019	Cider.
114	O. B. Bronson & Son	Janesville	Alden Vinegar Co	St. Louis, Mo	.97	3.22	1.019	Mixed malt, cider —whiskey.
115	F. W. Christman	Janesville	Roundy, Peckham & Co.	Milwaukee	.16	3.24	1.003	Whiskey.
116	C. E. Brown	Janesville	Dahinden & Gallasch	Milwaukee	.33	4 08	1.006	Whiskey.
117	Ball & Bates	Janesville	W. H. Bunge	Chicago	.17	6.43	1.005	Whiskey.
118	J. H. Jones	Janesville	Reed, Murdock & Fisher	Chicago	.87	3.63	1.013	Glucose.
119	F. E Westgate	Beloit	Schuyler & Cook	Chicago	2.25	3.71	1.013	Cider.
120	Pentland & Harmond	Beloit	Rosenteil & Son	Freeport, Ill	2.32	3.78	1.014	Cider.
121	Cowles & Mecham	Beloit	Reideburg & Co	Milwaukee	.15	3.89	1.006	Whiskey.
122	Stiles & Rogers	Beloit	C. E. Meyer	Freeport, Ill	.23	4.47	1.006	Whiskey.

ANALYSES OF VINEGAR—Continued.

Lab. No.	From whom taken.	Address.	Name of manufacturer.	Address.	Solids.	Acetic Acid.	Sp cific gravity.	Quality.
123	C. C. Green & Co.	Beloit	Reed, Murdock & Fisher.	Chicago	.28	5.24	1.009	Whiskey.
124	H. McGavock	Beloit	Alden Vinegar Co	St. Louis	.38	3.41	1.007	Whiskey.
125	C. A. Dean	Beloit	C. E. Meyer	Freeport, Ill	2.35	2.80	1.011	Cider.
126	Sanger & Blakesly	Beloit	C. Rosentiel & Son	Freeport, Ill	.28	4.10	1.006	Whiskey.
127	Sanger & Blakesly	Beloit	C. E. Meyer	Freeport, Ill	.26	4.01	1.005	Whiskey.
128	Roundy, Peckham & Co.	Milwaukee	Not known	....	1.75	4.44	....	Cider.
138	Hanson & Oleson	Eau Claire	Spink & Co	St. Paul	.36	4.71	1.009	Whiskey.
139	W. H. Kneeland	Eau Claire	Schuylar & Cook	Chicago	2.47	4.01	1.017	Cider.
140	John Kelley	Eau Claire	F. C. Johnson	Kiswaukee, Ill	1.86	5.94	1.016	Cider.
141	H. J. Forschler	La Crosse	Prussing Vinegar Co	Chicago	1.82	4.31	....	Cider.
142	H. J. Forschler	La Crosse	Prussing Vinegar Co	Chicago	.16	4.49	....	Whiskey.
143	H. J. Forschler	La Crosse	Prussing Vinegar Co.	Chicago	.15	4.51	1.008	Whiskey.
144	John Bergaust	La Crosse	Amazon Vinegar Works	Davenport, Iowa	2.86	4.30	....	Malt.
145	John Bergaust	La Crosse	Amazon Vinegar Works	Davenport, Iowa	1.26	5.34	1.015	Malt.
146	H. K. Stevens	La Crosse	Not known	....	3.84	2.83	1.018	Malt.
147	H. Husing Estate	La Crosse	Not known	....	.22	4.59	1.008	Whiskey.
148	A. A. McDonald & Son	La Crosse	Amazon Vinegar Works	Davenport, Iowa	.12	4.12	1.008	Whiskey.
149	H. Husing Estate	La Crosse	Amazon Vinegar Works	Davenport, Iowa	.07	3.09	1.005	Whiskey.
150	La Crosse Grocery Co.	La Crosse	Bunge & Co	Chicago	1.62	4.47	1.013	Cider.
151	O. Tollenson	La Crosse	Wieneke & Hoendale	Dubuque, Iowa	.23	4.10	1.008	Whiskey.
152	A. A. McDonald & Son	La Crosse	Amazon Vinegar Works	Davenport, Iowa	.19	3.99	1.008	Whiskey.
153	O Tollenson	La Crosse	Wineket & Hoendale	Dubuque, Iowa	.20	3.81	1.008	Whiskey.
154	W. W. Taylor	La Crosse	Merriam, Calkins & Co.	Chicago	3.04	4.79	1.020	Cider.
155	Culver & Newell	Eau Claire	Not known	....	.25	3.52	1.008	Whiskey.
156	M. S. Beecher	Eau Claire	American Vinegar Works	Sheboygan	.25	4.88	1.010	Whiskey.
157	Hanson & Oleson	Eau Claire	Spink & Co	St. Paul	.20	3.36	1.007	Whiskey.
158	H. Carpenter	Eau Claire	Eau Claire Com. Co	Eau Claire	.31	3.05	1.008	Whiskey.
159	Arthur Smith	Eau Claire	F. C. Johnson	Kiswaukee, Ill	1.71	5.61	1.014	Cider.
160	H. J. Forschler,	Eau Claire	Prussing Vinegar Co.	Chicago	1.89	4.36	1.015	Cider.
161	H. Carpenter	Eau Claire	Eau Claire Com. Co	Eau Claire	.40	3.15	1.008	Whiskey.
162	Culver & Newell	Eau Claire	Warsaw Pickle Co	Warsaw, Ill	2.75	3.28		Glucose.
177	H. Grove & Son	Madison	Not known	....	1.95	3.50	1.005	Cider.
178	H. Grove & Son	Madison	Not known	....	2.69	4.04	1.012	Cider.
179	H. Grove & Son	Madison	Not known	....	3.61	4.32	1.013	Malt.
180	H. Grove & Son	Madison	Not known	....	6.72	4.24	1.025	Malt.
181	H. Grove & Son	Madison	Not known	....	1.53	4.24	1.009	Cider.
194	O. J. Forschler	La Crosse	Not known	....	.23	5.1	....	Whiskey.
195	O. J. Forschler	La Crosse	Not known	....	.31	7.56	....	Whiskey.

196	O. J. Forschler	La Crosse	American Vinegar Works	Milwaukee	1.33	3.90		Cider.
198			American Vinegar Works	Milwaukee	2.73	7.28	1.018	Wine.
199			American Vinegar Works	Milwaukee	3.17	4.41	1.016	Cider.
200	W. T. Vankirk	Janesville	Not known		.46	4.47		Whiskey.
231			Geo. P. Peffer	Pewaukee	13.20		1.051	Cider.
232			Geo. P. Peffer	Pewaukee	9.26		1.029	Cider.
233			Geo. P. Peffer	Pewaukee	5.50	3.32	1.021	Cider.
234			Geo. P. Peffer	Pewaukee	2.39	2.73	1.070	Cider.
235			Geo. P. Peffer	Pewaukee	2.16	1.6	1.005	Cider.
236			Geo. P. Peffer	Pewaukee	2.22	3.38	1.011	Cider.
333	C. Falinger	Waterloo	Not known		.11	3.72	1.003	Whiskey.
334	C. Falinger	Waterloo	Not known		.22	4.12	1.004	Whiskey.
335	Hall & Alton	Pewaukee	Paul Bechtner	Milwaukee	.23	4.89	1.005	Whiskey.
435	Jorden & Hamner	Galesville	Not known		.4	3.24		Whiskey.
436			A. M. Richter & Son	Manitowoc	1.27	4.16		Fruit.
437			A. M. Richter & Son	Manitowoc	.18	4.26		Whiskey.
509	Thomas Ryall	Waukesha	F. C. Johnson	Kishwaukee, Ill	2.18	5.81	1.010	Cider.
622	Grubb Bros.	Janesville	Not known		2.17	4.02	1.015	Cider.
623	Grubb Bros.	Janesville	Not known		.17	3.26	1.005	Whiskey.
645	J. O. Hermann	Waupun	Vail & Howe	St. Louis	2.97	5.02		Cider.
655			Barrett & Prussing	Chicago	3.26	5.27		Cider.
656	M. L. Nelson	Madison			.78	4.38		Whiskey.
722	Correy Bros	Madison	C. E. Meyer	Freeport, Ill.	.77	4.29		Whiskey.
723	M. L. Nelson	Madison	Alden Vinegar Co.	St. Louis.	.40	3.57		Whiskey.
806	Grove & Son	Madison			3.09	4.00		Cider.
807	Grove & Son	Madison			1.45	4.10		Mixed.
808	Grove & Son	Madison			.26	3.90		Whiskey.
809	Grove & Son	Madison			.16	3.20		Whiskey.
811	J. J. Lucks & Son	Hudson	Alden Vinegar Co	St. Louis	.44	3.70		Whiskey.
817	L. M. Nelson	Madison	Alden Vinegar Co	St. Louis	.43	3.60		Whiskey.
844	Welsh & Carpenter	Madison	Barrett Prussing Co.	Chicago	1.67	3.75		Pine Ap. Vin.

SUMMARY OF VINEGAR.

Number of samples analyzed, 148.
Number that proved to be cider vinegar, 18.
Number that were whiskey vinegars, 95.
Number that were malt vinegars, 5.
Number that were glucose vinegars, 3.

The remaining twenty-eight samples contained more or less cider vinegar, but the solids had been reduced below the standard of two per cent. by the addition of whiskey vinegars.

Glucose and malt vinegars are rarely found on the market. At the time investigation of vinegars was begun charges were freely made in the press that large quantities of vinegar made from mineral acids were being consumed by the public. Contrary to expectations the vinegars found in the Wisconsin markets were free from adulteration by mineral acids.

If has been a pernicious custom for many years by the trade to foist upon the innocent purchaser a cheap imitation for cider vinegar. Many of these imitation vinegars are made from stale beers and bottle washings, and would be immediately driven from the markets if their identity were not so skillfully concealed by the manufacturer, who, in turn, is abetted by the conscienceless store keeper.

CREAM OF TARTAR.

The high price of cream of tartar causes it to be very generally adulterated. Besides the usual adulterants of tarch and terra alba, marble, alum and barium sulphates are used. Compounds of acid phosphates of lime, alum, sulphate of lime and starch are also put on the market and sold as cream of tartar, but at a much lower price. The following table shows the composition of cream of tartar as found in the Wisconsin market.

ANALYSIS OF CREAM OF TARTAR.

Lab. No.	Name of dealer.	Address.	Name of manufacturer.	Address.	Other ingredients.
78	A. M. Daggett.	Madison	Not known		Cream of tartar, plaster paris.
81	W. B. Esser	Madison	Not known		Plaster paris, sand, tartaric acid.
82	Olsen & Jacobson	Madison	De Land & Co	Fairport, N. Y.	Tartaric acid, plaster of paris.
83	R. Chase.	Madison	Ira Parmley	Center	Tartaric acid, acid phosphate of lime.
84	W. T. McConnell & Son	Madison	Sherman Bros	Chicago	Cream of tartar, acid phosphate of lime.
85	H. Kleuter.	Madison	Not known		Cream of tartar, acid phosphate of lime - starch.
86	A. A. Mayers.	Madison	Not known		Pure.
87	A. Findlay	Madison	Chapman, Smith & Co	Chicago	Pure
88	J. C. Light	Madison	Not known		Cream of tartar, plaster paris, acid phosphate of lime.
89	A. H. Hollister	Madison	Not known		Pure.
129	Sanger & Blakesley	Beloit	Not known		Tartaric acid, plaster paris.
130	H. McGavock	Beloit	Not known		Acid phosphate of lime.
131	Stiles & Rogers	Beloit	Jewett, Sherman & Co	Chicago	Pure.
132	F. E. Westgate	Beloit	R. M. & Fisher	Chicago	Tartaric acid, plaster paris.
133	C. C. Green	Beloit	Not known		Tartaric acid, plaster paris.
134	Pentland & Harmon	Beloit	Not known		Tartaric acid, plaster paris, alum.
135	Ball & Bates	Janesville	Not known		Plaster paris, acid phosphate of lime.
136	C. E. Brown	Janesville	J. S. Gould	Chicago	Cream of tartar, plaster paris, starch.
137	O. P. Bronson	Janesville	Not known		Alum, starch, tartaric acid.
163	E. J. Kelly	La Crosse	Not known		Tartaric acid, plaster paris, starch.
164	W. H. Kneeland	Eau Claire	Not known		Tartaric acid, plaster paris.
165	D. J. Van Hovenburg	Eau Claire	E. B. Miller & Co	Chicago	Pure.
166	E. A. Wilson	La Crosse.	Sherman Bros	Chicago	Tartaric acid, plaster paris, acid phosphate of lime, starch.
167	Arthur Smith	Eau Claire	Sprague. Warner & Co	Chicago	Plaster paris, acid phosphate of lime, starch, alum.
168	H. C. Stevens	La Crosse	Sherman Bros	Chicago	Pure.
169	H. Husing estate	La Crosse.	J. J. Hogan & Co.	La Crosse	Tartaric acid, plaster paris, acid phosphate of lime, starch.
170	Culver & Newell	Eau Claire	Eau Claire Grocery Co	Eau Claire	Tartaric acid, plaster paris.
171	W. W. Taylor	La Crosse	Not known		Pure.
187	E. B. Heimstreet	Janesville	Not known		Pure.
201	Ira Parmley	Center	Not known		Tartaric acid, plaster paris.
203	Ferris & Alvord	Whitewater	Sent by C. R. Beach	Whitewater	Tartaric acid, starch.
206	Hartshorn & Simmons	Clinton			Pure.
224	Roundy, Peckham & Co.	Milwaukee			Phosphate, sulphate, starch.
225	Roundy, Peckham & Co.	Milwaukee			Phosphate, sulphate, starch.
226	Roundy, Peckham & Co.	Milwaukee			Phosphate, sulphate, starch.
366	E. A. Holmes	Milton			Pure.
383	W. W. Taylor	La Crosse	Jewett, Sherman & Co	Milwaukee	Pure.
384	A. J. McDonald	La Crosse	Not known		Phosphate, starch.
624	C. L. Vale	Beloit	C. Pfizer	New York	Pure.

SUMMARY OF CREAM OF TARTAR.

Of the thirty-nine samples, but ten were found to be pure. Since baking powders have become so extensively used comparatively little cream of tartar is employed by the housewife. It enters more largely into the composition of medicines, and therefore the more important that it should be pure so that the desired effect be brought about. Even public health is not of enough importance to restrain unprincipled manufacturers from plying their nefarious prac tice for gain.

By consulting the above table the reader can determine at once the firms that handle adulterated stuffs.

The table needs no explanation except that tartaric acid and starch are not injurious. Every one knows how indigestible is sand, lime and plaster paris.

SYRUPS.

Syrups, molasses, golden syrup, etc , are terms used to denote a sweet syrup produced in the manufacture of sugar and containing a mixture of sugar, partly cane and partly fruit, together with certain salts and impurities. Before the manufacture of glucose had attained its present proportions, the term molasses was understood to mean the vicid, brown, uncrystallizable syrup which is drained from the moist sugar during its formation and from sugar moulds in the refinery. At the present time the term means a mixture of molasses and glucose or glucose alone. The manner in which glucose is made and the fact that, considered as a sugar it is different from that made from the sugar cane, has caused it to be looked on with suspicion by the public. The question is often asked whether artificial glucose contains injurious compounds arising from the chemicals used in its manufacture or produced from the starch itself. The question is best answered by a description of the methods used in the manufacture of the article. Corn is found to be the best material for the manufacture of glucose, owing to its cheapness and high percentage of starch. In Europe potatoes are used for the same reason.

After the starch is extracted the process of converting it into glucose is the same, although each manufacturer introduces slight modifications according to the grade of glucose to be produced. If corn is used as the source of starch, the following method is employed: The corn is steeped in water from 50 to 60 hours, the water being drawn off and a fresh supply added every ten hours. After steeping, the corn is thoroughly washed with clean water to rid it of all fermenting substances. While it is still wet it is ground by mill stones and the pasty mass is placed on sieves and washed. The starch passes through the sieves while the coarser parts including the albuminoids remain on the sieves. The starch which passes through the sieves is run into the settlers; cylinders ten feet in diameter and eight to ten feet high, and allowed to remain for four to six hours. After the starch is completely settled the water is run off as waste. The starch is then treated with a solution of caustic soda, to remove any remaining albuminoids, after which the mixture of starch and water is run into shallow vats and allowed to settle. It is then washed repeatedly to remove the alkali, the washing requiring about 60 hours. Fresh water is then added to the starch and it is drawn off into wooden converters. The temperature of the mixture is raised to 212° Fah., and to the starch paste from one and a half to two per cent. of sulphuric acid is added and the mixture boiled for about three hours. At the end of this time the starch has been converted into glucose and dissolved in the acid water. The acid solution is now treated with marble dust or chalk which combines with the acid forming sulphate of lime. The lime salt being insoluble settles to the bottom of the tank, leaving the "sweet water" nearly neutral; to remove any traces of acid lime, cream is added till the test shows no acid reaction. The solution is allowed to stand for several hours until the sediment settles to the bottom. The clear liquid is drawn off and decolorized by being filtered through bone black. It is then concentrated to the desired degree by evaporation. If glucose in mass is required the syrup is concentrated to 40° or 42° Baume, and after cooling run into barrels to solidify. When granular glucose is desired, it is evaporated to 32° Baume, and allowed to stand for 24 hours and cool as quickly as possible. The resulting syrup is placed in vats containing a small amount of sulphurous acid in solution to prevent fermentation. In about eight days crystallization begins and after two-thirds of the syrup has crystallized, the liquid is run off through holes in the bottom of the vat. The crystals are then dried. Besides glucose, these starch syrups contain as high as 40 per cent. of dextrine, together with ten to fifteen per cent. of maltose and fifteen per cent. of ash. The ash consists mostly of calcium sulphate which is left in syrup owing to incomplete purification. The glucose has a very extended use in the arts. Brewers and vinegar makers, as well as manufacturers of fancy sugars, sweetmeats, and preserves, use them in large quantities. Physiologically considered, glucose as found in the market is a good and wholesome food, and if it were sold as glucose no objection could be made to its use. But in being sold as a substitute for the sweeter and more valuable varieties of sugar, it is an adulterant.

ANALYSIS OF SYRUP.

Lab. No.	Name of dealer.	Address.	Name of manufacturer.	Address.	Trade mark.	Water.	Sucrose.	Glucose.	Ash	Undetermined.	Quality.
301	J. H. D. Baker	Madison	Not known		Sugar Syrup	26.3	40.42	25.	5.25	3.03	Molasses.
302	J. H. D. Baker	Madison	Not known		Honey Drip	27.		27.03		45.97	Glucose syrup.
303	A. E. Bunn	Madison	Sprage, Warner & Co.	Chicago	P. R. Syrup	30.	43.98	18.52	3.50	4.	Molasses.
304	W. T. McConnell	Madison	John S. Gould	Chicago	Cuba Bakers Mo.	30.3	32.29	23.26	8.25	5.9	Molasses.
305	Cromby, Smith & Co.	Milwaukee	Scully Syrup Co.	Chicago	Star Crystal	27.5		41.67	1.50	29.23	Glucose syrup.
306	J. H. D. Baker	Madison	Not known		N. O. Molasses	26.25	45.29	19.23	3.50	5.73	Molasses.
307	A. E. Burnham	Madison	John S. Gould	Chicago	Bee-hive Syrup	34.25	20.20	26.31	4.50	15.24	Molasses.
308	J. D. Imbusch	Milwaukee	Not known		W. Fancy Drip	25.		43.48	1.5	30.02	Glucose syrup.
309	Jacob Wellauer & Co.	Milwaukee	Not known		N. O. Molasses	23.25	20.37	32.25	3.25	20.88	Molasses.
310	A. E. Burnham	Madison	Bradshaw & Wait	Chicago	Golden Hive	20.25	19.37	32.25	2.75	25.88	Molasses.
311	Jacob Wellauer & Co.	Milwaukee	D. B. Sculley	Chicago	W. Clover Drips	20.25		45.45	.75	33.55	Glucose syrup.
312	H. S. Sheftlers & Son	Milwaukee	Nash, Spalding & Co.	Boston	Revere	34.25	31.09	27.74	3.75	13.17	Molasses.
313	Roundy, Peckham & Co	Milwaukee	Not known		Cuba Baking	31.25	30.42	22.22	7.50	9.11	Molasses.
314	J. H. D. Baker	Madison	Not known		N. O. Molasses	21.25	21.07	34.48	1.25	21.95	Molasses.
315	H. Sheftlers & Son	Milwaukee	Davenport Glu. Co.	Davenport, Ia.	Diamond Drip	24.50		41.67	1.	32.83	Glucose syrup.
316	Cromby, Smith & Co.	Milwaukee	American Glu. Co.	Buffalo, N. Y.	XX	20.75		50.	2.	27.25	Glucose syrup.
317	Cromby, Smith & Co.	Milwaukee	E. C. Knight & Co.	New York	Royal Drips	22.25	40.19	31.25	4.25	2.07	Molasses.
318	J. D. Imbusch	Milwaukee	Not known		Golden Drips	24.50	45.80	25.64	4.25		Molasses.
319	J. D. Imbusch	Milwaukee	Not known		B. 145	23.	41.13	30.31	3.50	2.07	Molasses.
320	H. Sheftlers & Son	Milwaukee	E. C. Knight & Co.	New York	Sugar Syrup	23.25	39.19	32.25	4.	1.31	Molasses.
321	Roundy, Peckham & Co	Milwaukee	Not known		W. Drip	20.50		55.55	1.25	22.70	Glucose syrup.
322	Jacob Wellauer & Co.	Milwaukee	Not known		Fancy P. R.	30.75	47.35	19.61	3.		Molasses.
323	W. T. McConnell	Madison	J. S. Gould	Chicago	N. O. Molasses	23.50	50.17	21.27	3.25	1.81	Molasses.
324	H. Sheftlers & Son	Milwaukee	E. C. Knight	New York	Blackstrap	31.	31.35	23.27	7.5	6.88	Molasses.
325	H. Sheftlers & Son	Milwaukee	Boston Sugar Co.	Boston, Mass.	Boston Syrup	23.50	27.00	23.81	8.	17.69	Molasses.
326	Jacob Wellauer & Co.	Milwaukee	Not known		Diamond Drips	22.75		46.51	2.	28.74	Glucose syrup.
327	Dewey & Davis	Milwaukee	Not known		Amer. Sug. XXX	40.50		31.25	4.25	25.	Glucose syrup.
328	Cromby, Smith & Co.	Milwaukee	Deckmeyer & Co.	New York	No. 20	24.	33.24	22.22	9.	11.44	Molasses.
329	Dewey & Davis	Milwaukee		Brooklyn	Br'klyn Sug. XXX	23.	43.91	22.73	7.5	2.86	Molasses.
330	Roundy, Peckham & Co	Milwaukee	J. O. Whiting	Boston, Mass.	P. R	26.75	26.78	35.72	3.5	7.25	Molasses.
331	Roundy, Peckham & Co	Milwaukee	Robert Cary & Co.	New Orleans	Bill Grove	23.25	31.25	31.25	4.5		Glucose syrup.
332	W. T. McConnell	Madison	Reed, Murdock & Co.	Chicago	W. Clover	25.45	6.45	37.03	2.00	29.07	Molasses.

SUMMARY OF SYRUPS.

Of the thirty-two samples of syrup examined, ten, or nearly one-third are found to be glucose syrups. The inferior sweetening power of glucose syrups make them an imposition upon the purchaser. It costs much less to produce a glucose syrup, yet there is but little difference in the retail prices of the genuine article and the cheap imitation.

For such articles of consumption as are compounded or mixed in such a manner that it is impossible to determine their make up, it is suggested that a law be passed that obliges a manufacturer to place upon his goods a label that discloses the per centum of the ingredients that are found in these compounds.

SPICES.

The samples of ground spices examined in the laboratory confirm the results found in other states and prove that in this article of food, adulteration is the rule and purity the exception. The high price of the pure spices and the popular demand for a cheap ground article has called forth much skill on the part of the dealer to satisfy the demand; and now he is able to put on the market an article which will satisfy all demands except those for purity and flavor.

A mixture of ground cocoa nut shells, buckwheat hulls and a little cayenne pepper for flavoring, passes for pure black pepper. Corn meal, ground olive stones and cayenne pepper passes for white pepper. Corn meal and tumeric and cayenne passes for pure ginger. Wheat flour, tumeric or Martin's yellow, and cayenne sells for pure mustard. New adulterations are constantly being discovered and the analyist is constantly called on to identify new adulterants. The adulterations usually found are: 1. The bran and hulls of various seeds, as buckwheat, wheat, mustard and flaxseed. 2. Damaged farinaceous substances such as spoilt flour, corn meal, bread, middlings of various kinds. 3. Leguminous seeds as peas, beans, etc. 4. Ground shells of the cocoa nut, almond and peanut. Ground olive stones are largely used. 5. Various coloring matter, as tumeric, Martin's yellow, charcoal, sienna and red ochre, etc. By a judicious mixing of the above materials a fair imitation of any spice can be made and placed on the market and the compound will meet with a ready sale if it is cheap enough. The use of the above articles has called into existence an industry of some magnitude, having for its object the manufacture of spice mixtures known as pepper dust. The term is usually abbreviated to "P. D.," and the manufacture of "P. D. Pepper," "P. D. Ginger" and "P. D. Cloves" is a large and increasing industry. These imitations, resembling the genuine article very closely and only lacking the necessary flavoring, are sold at from three to four cents per pound. Manufacturers openly advertise themselves as dealers in these articles. A journal devoted to spice milling contains advertisements like the following:

> "——— St., New York. Manufacturers of all kinds of spice mixtures. My celebrated brand of "P. D." pepper is superior to any made. Spice mixtures a specialty. Spices ground for the trade."

As the result of the practice above quoted spices are found containing the following adulterants:

Allspice; adulterants, spent cloves, clove stems, cracker dust, ground shells or charcoal, mineral color, yellow corn.

Cayenne; adulterants, rice flour, salt and ship stuff, yellow corn, tumeric, mineral red.

Cassia; adulterants, ground shells, crackers, tumeric, minerals.

Cinnamon; adulterants, Cassia bark, peas, starch, mustard hulls, tumeric, minerals, cracker dust, burnt shells, sugar.

Cloves; adulterants, spent cloves, clove stems, minerals, allspice, roasted shells, wheat flour, peas.

Ginger; adulterants, cereals, tumeric mustard hulls, cayenne, peas, exhausted ginger.

Mace; adulterants, cereals, buckwheat, wild mace.

Nutmeg; adulterants, starch, wild nutmeg.

Pepper; adulterants, pepper dust, ground crackers, rice, mustard hull, charcoal, cocoa nut shells, cayenne, beans, bran, white and yellow corn, ground olive stones.

Mustard; adulterants, flour, tumeric, Martin's yellow, peas, corn meal, gypsum, ginger, salt.

It will be seen that the adulterations met with are very numerous and the list is constantly changing as the supply of material and sources of refuse may suggest.

PEPPER.

Pepper is the most common of all the spices and is subject to the greatest adulteration. Blyth gives a list among which are "pepperdusts" known as "P. D.", "H. P. D.", "W. P. D." "P. D." composed of linseed cake; "H. P. D." hot pepper dust, made chiefly of mustard husks; and "W. P. D." white pepper dust, composed of ground rice. The adulterants are usually coarsely ground and it is not difficult on examination to pick out yellow corn, rice, cocoa nut shells, ground olive stones, etc. The appearance of the spice in its ground form makes it possible to use many kinds of refuse for adulteration, and advantage is taken of this fact to the utmost limit. Samples received at this laboratory have been so mild in flavor that it could hardly deserve the name of pepper.

MUSTARD.

Mustard is the flour of the white or black mustard seed from which the hulls have been separated by bolting. In the process of manufacture two customs have arisen which materially change the nature of the product. These are, first, the addition of flour for the purpose of improving its keeping qualities, and second, the removal of part of the fixed oil. The addition of flour gives the mustard such a white color that the addition of a coloring matter becomes necessary to restore the yellow color. The dye stuff is usually tumeric, but sometimes Martin's yellow is added. The last named is to some degree poisonous and should be prohibited. The removal of the oil is beneficial as it adds nothing to the flavor of the mustard and its presence injures the keeping qualities of the condiment. Although the addition of flour is harmless and has the sanction of long custom, it is gradually being given up and mustard containing nothing but the ground and bolted seed is now found in the market.

CAYENNE PEPPER.

Cayenne pepper consists of the ground pods of the several species of Capsicum. It is said to be adulterated with brick dust, red lead, and coloring matters. Yellow corn, tumeric, ground rice and red ochre have been found in it.

GINGER.

Ginger is the powdered root of a tropical plant, Zingiber officinale. Owing to carelessness in the preparation of the root, a large number of qualities and varieties are found on the market. The adulterations are the addition of flour or starch, coloring with tumeric. Mustard hulls and cayenne pepper have been found. Perhaps the most common adulteration is the addition of exhausted ginger, the refuse left from the manufacture of ginger extract. This adulteration has the appearance of the genuine article but lacks its flavor and pungency. Only a careful chemical analysis will show the adulteration.

CLOVES.

The flower buds of the clove dried and ground, constitute the spice. The flavor is due to a volatile oil which they contain. This oil being an article of commerce is extracted and the spent cloves remaining are largely used for adulteration. Clove stems and pimento are also added. Pimento has a clove-like flavor but is much inferior. Its price is less than one-fifth that of cloves. The addition of the coarser adulterants is not common.

CINNAMON AND CASSIA.

These spices are ground barks of several species of the genus cinnamonum. The barks vary greatly in appearance and quality. The cassia, although inferior to cinnamon in flavor, is frequently substituted for the finer flavored and higher priced cinnamon. Exhausted cinnamon is also used.

In one case the sweet taste of the exhausted cinnamon was made up by the addition of sugar.

Poivrette (ground olive stones) was also found.

ALLSPICE.

Allspice is one of the cheaper spices, but its low price does not prevent its adulteration. Exhausted cloves, clove stems, corn and ground shells have been found.

The results of the above analyses only confirm the results found in other parts of the country.

Spices found on the market are enormously adulterated. Over 200 samples have been gathered from various parts of the state. We have been able to examine but a few of each kind and therefore a detailed analysis is not included in this report. As soon as the samples on hand have been investigated a circular will be issued from the office of the commissioner which will give a comprehensive statement of adulteration in spices.

Respectfully yours,

F. G. SHORT,
State Chemist.

FINANCIAL STATEMENT.

DISBURSEMENTS FOR THE YEAR ENDING SEPTEMBER 30, 1889.

H. C. Thom, commissioner, postage	$150 00
H. C. Thom, commissioner, stationery and rec. book	38 65
H. C. Thom, commissioner, compiling laws	50 00
H. C. Thom, commissioner, rubber stamps and drayage	5 50
F. G. Short, assistant. traveling expenses	77 84
W. J. Park & Sons, stationery	25 60
Frank S. Horner, envelopes and printing	38 85
W. J. Park & Sons, merchandise	2 85
Schwaab Stamp & Seal Co., stamps	5 50
H. C. Thom, freight on apparatus	15 21
H. C. Thom, expressage and record book	19 65
Eimer & Amend, apparatus and chemicals	822 85
Bausch & Lomb Optical Co., merchandise for laboratory	98 63
Ramsay, Lerdall & Guldemann, merchandise and labor	74 07
Emil Greiner, merchandise for laboratory	17 40
Madison Gas Co., setting gas meter	4 00
Thomas Regan, labor and material	156 56
Eimer & Amend, merchandise	11 82
H. C. Thom, labels	2 90
A. H. Barber, cheese for experiments	1 02
Otto Laverenz & Bros., merchandise	4 60
George Burroughs, merchandise	15 00
Dunning & Sumner, merchandise	7 23
A. C. McClurg & Co., cyclopedia	6 75
	$1,652 48

DISBURSEMENTS FOR THE YEAR ENDING SEPTEMBER 30, 1890.

H. C. Thom, traveling expenses	$205 60
H. K. Loomis, traveling expenses	338 22
F. G. Short, traveling expenses	124 59
F. G. Short, merchandise for laboratory	90 72
J. H. D. Baker, merchandise for analysis	5 50
Wm. F. Vilas, rent of laboratory	125 00

Democrat Printing Co., stereotyping	$3 00
F. B. Fargo & Co., merchandise	6 40
A. H. Hollister, merchandise	1 83
Frank S. Horner, envelopes and printing	36 35
Frank Horner, merchandise	2 95
Madison Gas Co., gas for laboratory	12 39
Madison post office, stamps	5 00
W. J. Park & Sons, merchandise	2 20
W. J. Park & Sons, stationery	20 70
H. C. Thom, cash paid for mailing circulars	11 50
H. C. Thom, merchandise for laboratory	4 11
H. C. Thom, postage	85 00
H. C. Thom, stamps and samples	17 03
H. C. Thom, merchandise for laboratory	3 20
H. C. Thom, the Analyst, for laboratory	18 87
Eimer & Amend, merchandise for laboratory	129 51
H. K. Loomis, samples for analysis	23 92
Madison post office, box rent	2 00
Ramsey, Lerdall & Guldeman, merchandise	17 86
Cham Ingersol, circulars	2 50
State Journal Printing Co., printing	24 00
	$1,324 95

OLEOMARGARINE.

DEALERS IN OLEOMARGARINE IN WISCONSIN JANUARY 15, 1890.

John C. Roehm	Ashland.
J. B. Matthews & Co	Ashland.
Hougenson & Lorsen	Ashland.
T. F. Mackmiller & Co	Ashland.
Bordon & Kellogg	Ashland.
Armour Packing Co	Ashland.
Lake Superior Beef Co	Ashland.
W. H. Mackmiller & Co	Ashland.
Bird & Wells Lumber Co	Big Wausaukee.
Chippewa Valley Mercantile Co	Chippewa Falls.
W. C. Noall	Commonwealth.
Butler, Mueller & Co	Crivitz.
T. B. Walsh	Eagle River.
Eau Claire Grocery Co	Eau Claire.
Chainey & Goodwin	Florence.
Albrecht & Kneeborn	Florence.
N. Wisconsin Lumber Co	Hayward.
Wisconsin Valley Lumber Co	Harrison.
Gogebic Meat and Provision Co	Hurley.
Waters & Becker	Hurley.
Forsland & Co	Hurley.
F. D. Day	Hurley.
Place & Smith	Marinette.
E. H. Schwartz & Co	Marinette.
Hastings & Co	Marinette.
Julius Thielman	Merrill.
M. McCarthy & Co	Merrill.
J. J. Anderton	Milwaukee, 316 Third St.
F. L. Ande	Milwaukee, 79 Juneau St.
John Braack	Milwaukee, 129 Clinton St.
C. Schroeder	Milwaukee, 163 Huron St.
James Kubal	Milwaukee, 481 Mitchell St.
F. W. Mueller	Milwaukee, 200 Fifth St.
Ignatz Czerwinski	Milwaukee, 419 Mitchell St.
J. C. Thiele	Milwaukee, 385 Third St.
Steinmeyer & Hesse	Milwaukee, 375 Grove St.
Milwaukee Packing Co	Milwaukee, 114 Sycamore St.
W. Steinmeyer	Milwaukee, 331 Chestnut St.
Savage & Sons	Milwaukee, 157 Huron St.

D. C. Adams	**Milwaukee, 306 Wells St.**
W. F. Jorden	**Milwaukee, 4th Ward Market.**
L. Frank & Son	**Milwaukee, 644 Market St.**
F. J. Grant	**Milwaukee, 857 Kinnikinnic Ave.**
W. Cudahy	**Milwaukee, 230 Reed St.**
Armour & McCabe	**Milwaukee, 303 Reed St.**
R. T. Clark	**Milwaukee, 107 Fowler St.**
J. Karker	**Milwaukee, Juneau & E. Water Sts.**
Paul Noe	**Milwaukee, 389 Mitchell St.**
J. Porter	**Milwaukee, 261 S. Water St.**
James & Ripley	**Oshkosh.**
Wright Bros. & Co	**Pike.**
David Tripp	**Pike.**
G. A. Rickerman	**Racine.**
Leo. A. Peil	**Racine, 6th St.**
Hanley Bros	**Racine, 602 State.**
Samuel Yates	**Racine, 315 6th St.**
Hanson & Albertson	**Racine, 1200 State St.**
Brown Bros	**Rhinelander.**
H. Meisner	**Wittenburg.**
Nye, Lusk & Hudson	**Thorpe.**
James Celhopen	**Tomahawk.**
A. Beansioel & Son	**Wausau.**
Armour & Co	**Wausau.**
R. P. & J. N. Munson	**Wausau.**
Prairie River Lumber Co	**Wausau, P. O., Town 34, Sec. 19, R. 9, E.**

ERRATUM.

On page 81, under remarks on oleomargarine, at beginning of last paragraph on page, sixty thousand cows should read *six hundred and twenty-six thousand cows.*

APPENDIX.

Laws of Wisconsin Relating to the Office and Duties of Dairy and Food Commissioner.

OF THE OFFICE AND DUTIES OF THE FOOD AND DAIRY COMMISSIONER.

Chapter 452, Laws of 1889.

Section 1. The office of dairy and food commissioner for the state of Wisconsin, is hereby created. Such commissioner shall be appointed by the governor, by and with the advice and consent of the senate, and his term of office shall be for two years from the date of his appointment, and until his successor is appointed and qualified; provided, that the term of office of the commissioner first appointed under this act shall expire on the first Monday in February, 1891, and vacancies occurring in the office for any cause shall be filled by appointment for the balance of the unexpired term. The salary of the commissioner shall be twenty-five hundred dollars per annum and his necessary and actual expenses incurred in the discharge of his official duties.

Section. 2. Such commissioner may with the consent and advice of the governor, appoint two assistants, each of acknowledged standing, ability and integrity, one of whom shall be an expert in the matter of dairy products and the other of whom shall be a practical analytical chemist. The salaries of such assistants shall not exceed eighteen hundred dollars each per annum and their necessary and actual expenses incurred in the discharge of their official duties.

Section 3. It shall be the duty of the commissioner to enforce all laws that now exist, or that may hereafter be enacted in this state, regarding the production, manufacture or sale of dairy products, or the adulteration of any article of food or drink or of any drug; and personally or by his assistants to inspect any article of milk, butter, cheese, lard, syrup, coffee or tea, or other article of food or drink or drug, made or offered for sale within this state which he may suspect or have reason to believe to be impure, unhealthful, adulterated, or counterfeit, and to prosecute, or cause to be prosecuted, any person or persons, firm or firms, corporation or corporations, engaged in the manufacture or sale of any adulterated or counterfeit article or articles of food or drink or drug, contrary to the laws of this state.

SECTION 4. Said commissioner or any assistant shall have power in the performance of his official duties to enter into any creamery, factory, store, salesroom or other place or building where he has reason to believe that any food or drink or drug is made, prepared, sold or offered for sale, and to open any cask, tub, package or receptacle of any kind containing, or supposed to contain, any such article, and to examine or cause to be examined and analyzed the contents thereof, and the commissioner or any of his assistants may seize or take any article of food or drink or drug for analysis, but if the person from whom such sample is taken shall request him to do so he shall at the same time, and in the presence of the person from whom such property is taken, securely seal up two samples of the article seized or taken, the one of which shall be for examination or analysis under the direction of the commissioner, and the other of which shall be delivered to the person from whom the articles was taken. And any person who shall obstruct the commissioner or any of his assistants by refusing to allow him entrance to any place which he desires to enter in the discharge of his official duty, or who refuses to deliver to him a sample of any article of food or drink or drug made, sold, offered or exposed for sale by such person, when the same is requested and when the value thereof is tendered, shall be deemed guilty of a misdemeanor punishable by a fine of not exceeding twenty-five dollars for the first offense and not exceeding five hundred dollars or less than fifty dollars for each subsequent offense.

SECTION 5. It shall be the duty of the district attorney in any county of the state, when called upon by the commissioner or any of his assistants to render any legal assistance in his power to execute the laws, and to prosecute cases arising under the provisions of this act, and all fines and assessments collected in any prosecution begun or caused to be begun by said commissioner or his assistants shall be paid into the state treasury.

SECTION 6. With the consent of the governor, the state board of health may submit to the commissioner, or to any of his assistants, samples of water or of food or drink or drugs, for examination or analysis, and receive special reports showing the results of such examinations or analysis. And the governor may also authorize the commissioner or his assistants, when not otherwise employed in the duties of their offices, to render such assistance in the farmers' institutes, dairy and farmers' conventions, and the agricultural department of the university, as shall by the authorities be deemed advisable.

SECTION 7. The salaries of the commissioner and his assistants shall be paid out of the state treasury in the same manner as the salaries of other officers are paid, and their official expenses shall be paid at the end of each calendar month upon bills duly itemized and approved by the governor, and the amount necessary to pay such salaries and expenses is hereby appropriated annually.

SECTION 8. The commissioner may, under the direction of the governor, fit up a laboratory, with sufficient apparatus for making the analysis contemplated in this act, and for such purpose the sum of fifteen hundred dollars, or so much thereof as may be necessary, is hereby appropriated, and for the purpose of providing materials, and for other necessary expenses connected with the making of such analyses, there is also hereby appropriated so much as may be necessary, not exceeding six hundred dollars annually. The appropriations provided for in this section shall be drawn from the state treasury upon the certificates of the governor.

SECTION 9. Said commissioner shall be furnished a suitable office in the capitol, at Madison, and shall make an annual report to the governor, which shall contain an itemized account of all expenses incurred and fines collected, with such statistics and other information as he may regard of value, and with the consent of the governor, not exceeding twenty thousand copies thereof, limited to three hundred pages, may be published annually as other official reports are published, and of which five thousand copies shall be bound in cloth.

SECTION 10. All acts and parts of acts conflicting with this act are hereby repealed.

SECTION 11. This act shall take effect and be in force from and after its passage and publication.

Approved April 16, 1889.

Note to section 4, supra.—If there is contradictory evidence concerning the sufficiency of the seal of a sample, and the credibility of the witnesses for the prosecution is submitted to the jury, the defendant is not injured. If there is evidence that a few drops of carbolic acid was added to a sample of milk, and it is submitted to the jury as a question of fact whether this would change the character of the milk, make the analysis impossible or difficult, or in any way injuriously affect the sample for the purpose of analysis, the defendant has no cause of complaint. *Commonwealth Spear*, 143 Mass., 172.

It is observed of a similar statute that it is intended to secure a fair examination and analysis, by providing the defendant with the means of making an analysis of a portion of the same specimen which the state has analyzed. If the sample is not saved, or not saved in proper condition, he has no means of showing that his evidence, if any he has as to the quality of the milk, applies to that with reference to which the government witnesses testify. It cannot be said that a portion reserved is sealed, within the meaning of the statute, when wax is merely placed on the top of the cork, and not extended over the mouth of the bottle and thus making it air-tight, if it is shown that the character of the milk will be affected by the air. *Commonwealth v. Lockhardt*, 144 Mass., 132.

Where the article analyzed has not been taken under the statute, the competency of evidence is to be determined by the common law, and the testimony of any person who had sufficient skill to analyze it, and who had analyzed some which was proven to have been sold by the defendant, is admissible. *Commonwealth v. Holt*, 146 Mass., 38.

PURE MILK, STANDARD OF.

Chapter 425, Laws of 1889.

SECTION 1. Any person who shall sell or offer for sale or furnish or deliver, or have in his possession, with intent to sell or offer for sale or furnish or deliver to any creamery, cheese factory, corporation, person or persons whatsoever, as pure, wholesome and unskimmed, any unmerchantable, adulterated, impure or unwholesome milk, shall upon conviction thereof, be punished by a fine of not less than ten nor more than one hundred dollars for each and every offense.

SECTION 2. In all prosecutions or other proceedings under this or any other law of this state relating to the sale or furnishing of milk, if it shall be proven that the milk sold or offered for sale, or furnished or delivered, or had in possession with intent to sell or offer for sale, or to furnish or deliver as aforesaid, as pure, wholesome and unskimmed, contains less than three per centum of pure butter fat, when subjected to chemical analysis or other satisfactory test, or that it has been diluted or any part of its cream abstracted, or that it or any part of it was drawn from cows known to the person complained of to have been within fifteen days before or four days after parturition, or to have any disease or ulcers or other runnning sores, then and in either case the said milk shall be held, deemed and adjudged to have been unmerchantable and adulterated, impure or unwholesome, as the case may be.

SECTION 3. All acts and parts of acts conflicting with or contrary to the provisions of this act are hereby repealed.

SECTION 4. This act shall take effect and be in force from and after its passage and publication.

Approved April 16, 1889.

Note — Validity.— A New York law (chapter 183, of 1885; chapter 202, of 1884), provides that "no person or persons shall sell, supply or bring to be manufactured, to any butter or cheese manufactory, any milk diluted with water, or any unclean, impure, unhealthy, adulterated or unwholesome milk." *Held* a valid exercise of legislative power. *People v. West,* 106 N. Y., 293.

A statute is not invalid because it fixes an arbitrary standard for pure or unadulterated milk, though it is drawn from healthy cows, and is sold in its natural state. *In People v. Cipperly,* 37 Hun. (N. Y.), 324, it was held otherwise, one judge dissenting.

On appeal this case was reversed, without opinion, on the grounds given in the dissenting opinion: 101. N. Y., 634. The supreme court of New Hampshire say on this question: Practically it makes no difference whether milk is diluted after it is drawn from the cow, or whether it is made watery by giving her such food as will produce milk of an inferior quality, or whether the dilution, regarded by legislature as excessive, arises from the nature of a particular animal, or a particular breed of cattle. The sale of such milk to unsuspecting consumers, for a price in excess of its value is a fraud, which the statute was designed to suppress. It is a valid exercise by the legislature of the police power for the prevention of fraud, and protection of the public health, and as such is constitutional. *State v. Campbell,* 13 Atl. Rep., 585.

Construction — Indictment.— The New York law does not make fraudulent intent a necessary ingredient of the offense and it would not be a reasonable construction of it to apply it to a dairyman who owns and conducts a butter or cheese factory for the manufacture of those articles from milk furnished exclusively by himself, from his own cows. If the defendant is such a person, these facts are matter of defense, and their existence need not be negatived on the face of the indictment. *People v. West,* 106 N. Y., 293.

Under a Massachusetts law imposing a penalty for selling or offering to sell "adulterated milk, or milk to which any foreign substance has been added," it is immaterial whether the substance added is injurious or not. The indictment need not allege the quantity of such substance. *Commonwealth v. Schaffner,* 16 Northeast. Rep., 280.

Under an act which prohibits the sale of milk which is not of a good, standard quality, the fact that the milk was delivered under a contract to furnish the person who bought it with the milk of one dairy, is not a defense if that furnished was not of such quality. The contract would be held to contemplate milk which should be bought and sold. *Commonwealth v. Holt*, 14 Northeast. Rep., 930.

Where one is charged with having in his possession, with intent to sell, milk which is not of a good, standard quality, the fact that he was upon a wagon which had his name painted on it, and that therein were cans of milk, and that a sample was given from one of them to one employed by the milk inspector for analysis, is competent evidence to go to the jury upon the question of his intent. *Commonwealth v. Rowell*, 15 Northeast. Rep., 154.

Effect of the act of 1889 upon previous laws.—It seems reasonably clear that section 1, of chapter 425, laws of 1889, *supra*, supersedes section 1, of chapter 157, laws of 1887, as to the offense of selling diluted, impure and unclean milk. Both the acts referred to cover the provisions of section 4607, Revised Statutes, and hence that section is not in force.

PROOF OF ADULTERATION, HOW MADE.

Section 2, of chapter 157, of the Laws of 1887, as amended by chapter 344, Laws of 1889.

Section 2. Proof of adulterations and skimming may be made with such standard tests and lacometers as are used to determine the quality of milk, or by chemical analysis.

Section 2. This act shall take effect and be in force from and after its passage and publication.

Approved April 10, 1889.

FRAUDULENT BUTTER AND CHEESE.

Chapter 424, Laws of 1889.

SECTION 1. No person shall manufacture, mix or compound with or add to natural milk, cream or butter, any animal fats or animal or vegetable oils, nor shall he make or manufacture any oleaginous substance not produced from milk or cream, with intent to sell the same for butter or cheese made from unadulterated milk or cream, or have the same in his possession or offer the same for sale with such intent, nor shall any article or substance or compound so made or produced be sold intentionally or otherwise as and for butter or cheese the product of the dairy. Whoever violates any of the provisions of this section shall be guilty of a misdemeanor, and be punished by a fine of not less than fifty dollars ($50), nor more than five hundred dollars ($500.)

SECTION 2. All acts or parts of acts inconsistent with this act are hereby repealed.

SECTION 3. This act shall take effect and be in force from and after its passage and publication.

Approved April 16, 1889.

NOTE.— This act supersedes chapter 361, laws of 1885, so far as the last mentioned act is valid. The act of 1885 prohibited the manufacture out of any oleaginous substances, or any compound of the same, other than that produced from unadulterated milk, or cream from the same, any article designed to take the place of butter or cheese, produced from pure unadulterated milk, or cream of the same, and the offering of the same for sale or selling it as an article of food, without providing, as does the act of 1889, that the sale or offering for sale such an article must be made as and for butter or cheese, the product of the dairy. See, to the effect that such a clause is unconstitutional, *People v. Arensberg*, 103 N. Y., 388.

NOTE — **Origin.**— This section, except as to the penalty, is a copy of part of section 8, chapter 183, laws of New York, 1885.

Validity.— Section 7, chapter 183, laws of New York, 1885, "prohibits: 1st. The manufacture out of any animal fat, or animal or vegetable oils, not produced from unadulterated milk or cream from the same, of any product in imitation or semblance or designed to take the place of natural butter produced from milk, etc. 2d. Mixing, compounding with, or adding to milk, cream or butter, any acids or other deleterious substances, or animal fats, etc., with design or intent to produce any article in imitation or semblance of natural butter. 3d. Selling, or keeping or offering for sale any article manufactured in violation of the provisions of this section." *Held,* that if butter made from animal fat or oil is as wholesome and nutritious and suitable for food as dairy butter, the producers of butter made from animal fat or oils have no constitutional right to resort to devices for the purpose of making their product resemble in appearance the more expensive article known as dairy butter. It is competent for the legislature to enact laws to prevent the simulated article being put upon the market in such a form and manner as to be calculated to deceive. The statute is intended to reach a designed and purposed imitation of dairy butter in manufacturing the product which is not such butter, and not a resemblance in qualities inherent in the articles and common to both kinds of butter. *People v. Arensberg,* 105 N. Y., 123.

A state may lawfully prohibit the manufacture out of oleaginous substances, or out of any of its compounds other than that produced from unadulterated milk or cream from such milk, of an article designed to take the place of butter or cheese produced from unadulterated milk. It may also prohibit the manufacture, or sale, or the offering for sale, of any imitation or adulterated butter or cheese, or the having of it in possession with intent to sell the same as an article of food. *Powell v. Pennsylvania,* 127 U. S., 678.

Though it may be severe to punish those who unintentionally sell the article prohibited, the legislature has power to so provide in order that the much larger number may be protected. *State v. Newton,* 14 Atl. Rep., 604.

The supreme court of New Jersey has held that a statute enacted for a purpose similar to that which caused the passage of this act is not invalid because it prohibits the sale of oleomargarine brought to that state from other states and not intended for further transportation. The act produces only an indirect and incidental effect upon interstate commerce. *State v. Newton,* 14 Atl. Rep., 604.

CHEESE MUST BE MARKED SO AS TO INDICATE ITS QUALITY.

Chapter 240, Laws of 1887, as amended by chapter 455, Laws of 1889.

SECTION 1. Every person who shall at any cheese factory in the state, manufacture any cheese shall distinctly and durably stamp or mark upon each and every box, case or package of cheese manufactured and sold, the name and location of the cheese factory at which the same was made, and all cheese made from milk, containing three per centum or more of pure butter fat, shall be branded as full cream. And if any manufacturer of cheese shall sell or dispose of any cheese without such stamp or mark, or shall falsely stamp or mark the same as full cream, when made from milk containing less than three per centum of pure butter fat, he shall forfeit and pay to any person who shall prosecute for the same the sum of twenty dollars for every box, case or package of cheese sold or disposed of without being marked as prescribed in this act or with a false mark thereon, to be recovered in a civil action in any court having jurisdiction of the person and subject matter, one-half of such penalty to be paid into the county treasury of the county in which such action is brought, to be by said treasurer paid to the state treasurer for the benefit of the school fund.

SECTION 2. This act shall take effect and be in force from and after its passage and publication.

Approved April 17, 1889.

NOTICE TO BE GIVEN IF IMITATION BUTTER OR CHEESE IS OFFERED FOR SALE OR USE.

Chapter 185, Laws of 1887.

SECTION 1. Any person who shall knowingly make, traffic and sell olio-butter, butterine or any other imitation of butter or cheese, or who shall knowingly keep upon his table in any hotel, restaurant or boarding house, any imitation butter shall make the same fully known to the buyer, by posting up notices of the fact at and in the place where such articles are for sale or for consumption.

SECTION 2. Any person who shall omit posting up such notice, shall be punished by imprisonment in the county jail not more than thirty days or by a fine not to exceed twenty-five dollars.

SECTION 3. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

SECTION 4. This act shall take effect and be in force from and after its passage and publication.

Approved March 31, 1887.

ADULTERATED HONEY MUST BE MARKED.

Part of Chapter 40, Laws of 1881.

SECTION 2. Every person, company or corporation, who shall sell or offer for sale, honey, or any imitation of honey, which is adulterated with glucose, or any other substance, shall mark the package or parcel with the words "adulterated honey," as required by section one of this act.

NOTE.—Section 1, of chapter 40, laws of 1881, related to the manufacture of imitation butter, and provided that each ferkin, tub, package or parcel thereof, should be marked on top of same in letters not less than one-half inch in length, and breadth in proportion, and in such manner that it may be plainly seen. As applied to butter the said section was repealed by chapter 361, laws of 1885. Section 3, of the act of 1881, related to imitation cheese. It was also repealed by the act of 1885.

SECTION 4. Any person found guilty of any violation of this act, shall, for each offense be punished by imprisonment in the county jail, not less than ten days nor more than six months, or by a fine of not less than ten dollars nor more than one hundred dollars, or both, in the discretion of the court.

SECTION 5. One-half of all fines imposed by the enforcement of this act shall be paid to the person who informs against and prosecutes such offender to conviction.

SECTION 6. All acts or parts of acts conflicting with the provisions of this act are hereby repealed.

SECTION 7. This act shall take effect and be in force from and after its passage and publication.

Approved March 3, 1881.

PENALTY FOR THE SALE OF UNWHOLESOME PROVISIONS.

Section 4599, Revised Statutes.

Section 4599. Any person who shall knowingly sell any kind of diseased, corrupt or unwholesome provisions, whether for meat or drink, without making the same fully known to the buyer, shall be punished by imprisonment in the county jail not more than six months, or by fine not exceeding one hundred dollars.

ADULTERATION OF FOOD, LIQUORS AND CANDIES.

Section 4600, Revised Statutes.

Section 4600. Any person who shall fraudulently adulterate, for the purpose of sale, any substance intended for food, or any wine, spirits, malt liquor, or other spirituous liquors, or any other fluid, intended for drinking, or any candy or sweetmeat, with any substance, coloring matter, or anything poisonous, deleterious or injurious to health, or who shall knowingly manufacture, sell, or offer for sale, any such adulterated food, liquor, candy or sweetmeat, shall be punished by imprisonment in the county jail, not more than six months, or by fine not exceeding one hundred dollars, and any article so adulterated shall be forfeited and destroyed.

Note.— See chapter 248, laws of 1879, *infra,* which appears to supersede this section in part.

ADULTERATION OF FOOD AND DRUGS.—DECEPTIVE LABELING OF.

Chapter 248, Laws of 1879.

Section 1. No person shall mix, color, stain, powder order or permit any other person to mix, color, stain or powder any article of food with any ingredient or material so as to render the article injurious to health, with intent that the same may be sold in that condition. And any person that shall sell any such article so mixed, colored, stained or powdered, shall be subject to a penalty in each case not exceeding a fine of fifty dollars for the first offense, and for a second offense shall be punished by imprisonment in the state prison for a period not exceeding one year, with hard labor.

SECTION 2. No person shall, except for the purpose of compounding as hereinafter described, mix, color, stain or powder, or permit any other person to mix, color, stain or powder, any drug with any ingredient or material so as to affect injuriously the quality or potency of such drug, with intent that the same may be sold in that condition. And any person who shall sell any such drug so mixed, colored, stained or powdered shall be liable to the same penalty or punishment in each case respectively, as in the preceding section, for a first and subsequent offense; provided, that no person shall be liable to be convicted under the foregoing sections of this act, in respect to the sale of any article of food or of any drug, if he shows to the satisfaction of the justice or court before whom he is charged that he did not know of the article or drug sold by him being so mixed, colored, stained or powdered, as in that section mentioned, and that he could not, with reasonable diligence, have obtained that knowledge; or that such mixing, coloring staining or powdering was required for the production, extraction, preparation, preservation, consumption or transportation as an article of commerce in a state fit for carriage; or where the drug or food is supplied in the state required by the specification of the patent in force; or that the food or drug was unavoidably mixed with some extraneous matter in process of collection or preparation.

SECTION 3. Every person who shall compound or put up for sale any food, drug or liquor, in casks, boxes, bottles or packages, with any label, mark or device whatever, so as and with intent to mislead or deceive as to the true name, nature, kind and quality thereof, shall be liable to a penalty of not to exceed five hundred dollars for the first offense, and for every offense after the first offense shall be punished by imprisonment in the state prison for not less than one year nor more than ten years.

SECTION 4. The term "food" as herein used shall include every article used for food or drink by man other than drugs. The term "drug" shall include medicine for internal or external use.

SECTION 5. This act shall take effect and be in force from and after the first day of July, after its passage and publication.

Approved March 5, 1879.

ADULTERATION OF DRUGS AND MEDICINES.

Section 4601, Revised Statutes.

SECTION 4601. Any person who shall fraudulently adulterate, for the purpose of sale, any drug or medicine, in such a manner, as to render the same injurious to health, shall be punished by imprisonment in the county jail, not more than one year, or by fine not exceeding three hundred dollars.

NOTE.—See chapter 248, laws of 1879, *supra.*

COLORING GRAIN.

Section 4606, Revised Statutes.

SECTION 4606. Any person who shall fumigate any barley, wheat, or other grain, by the use of sulphur or other substance, or shall in any way, or by the use of any chemical, material or process, affect the color or healthfulness of such grain, or who shall sell or offer for sale any such grain, knowing that the same has been so fumigated, or the color or healthfulness thereof so affected, shall be punished by imprisonment in the county jail, not more than one month, or by fine not exceeding fifty dollars.

OF THE ANALYSIS OF FOOD, DRUGS AND DRINKS.

Chapter 252, Laws of 1880.

SECTION 1. The governor of the state shall appoint one of the professors of the state university of sufficient competence, knowledge, skill and experience, as state analyst, whose duty it shall be to analyze all articles of food and drink, and all drugs and liquors manufactured, sold or used within this state, when submitted to him as hereinafter provided. The term of office of such analyst shall be three years from his appointment, unless sooner removed by the appointing power, and his compensation shall not exceed two hundred dollars in addition to his annual salary as professor, and shall be paid by the board of regents of the state university from the university fund.

SECTION 2. The state board of health and vital statistics, medical officers of health, inspectors of weights and measures, boards of supervisors of any town, boards of trustees of any village, aldermen or common council of any city in this state, or a majority of said corporate bodies, may at the cost of their respective corporations, purchase a sample of any food, drugs or liquors offered for sale in any town, village or city in this state, in violation of sections number one, two and four of chapter two hundred and forty-eight of laws of A. D. 1879, or if they have good reasons to suspect the same to have been sold, or put up for sale, contrary to the provisions of said chapter two hundred and forty-eight, may submit the same to the state analyst as hereinafter provided, and the said analyst shall, upon receiving such article duly submitted to him, forthwith analyze the same, and give a certified certificate to such person or officer submitting the same, wherein he shall fully specify the result of the analysis.

SECTION 3. Any person purchasing any article with the intention of submitting it to an analysis, shall, after the purchase shall have been made and completed, forthwith notify the seller or his agent selling the same, of his or their intention to have the same analyzed by the state analyst, and shall offer to accompany the seller or his agent with the article purchased to the town, village or city clerk of the place in which the article was bought, and shall forthwith remove the article purchased to the office of said clerk, and in the presence of the seller or his agent, if present, divide said article in two parts, each to be marked, fastened and sealed up in such a manner as its nature will permit. The said clerk shall forthwith forward one part to the state analyst by mail, express or otherwise, as he shall elect, and shall retain the other part or package subject to the order of any court in which proceedings shall thereafter be taken. The certificate of the state analyst shall be held in all the courts of this state as prima facie evidence of the properties of the articles analyzed by him.

Section 4. If any person applying to purchase any article of food, drug or liquor exposed for sale or on sale by retail on any premises in any town, village or city in this state, and shall tender the price of the quantity which he shall want, for the purpose of analyzing, not being more than shall be reasonably required, and the person exposing the same for sale shall refuse to sell the same, such person so refusing to sell shall be liable to a penalty not exceeding fifty dollars.

Section 5. The state analyst shall report to the state board of health and vital statistics the number of all the articles analyzed, and shall specify the results thereof to said board annually, with full statement of all the articles analyzed and by whom submitted.

Section 6. The state board of health and vital statistics may submit to the state analyst any samples of food, drugs or drink for analysis, as hereinbefore provided.

Section 7. This act shall take effect and be in force from and after its passage and publication.

Approved March 15, 1880.

THE PREVENTION OF FRAUD IN DAIRY MANUFACTORIES.

Section 1494a, Revised Statutes.

Any butter or cheese manufacturer who shall knowingly use, or allow any of his employes or any other person to use for his or for their own individual benefit, any milk, or cream from the milk, brought to said butter or cheese manufacturer, without the consent of all the owners thereof, or any butter or cheese manufacturer who shall refuse or neglect to keep, or cause to be kept, a correct account (open to the inspection of any one furnishing milk to such manufacturer) of the amount of milk daily received, or of the number of pounds of butter, and the number and aggregate weight of cheese made each day, or of the number cut or otherwise disposed of, and the weight of each, shall, for each and every offense, forfeit and pay a sum not less than twenty-five dollars, nor more than one hundred dollars, to be recovered in an action in any court of competent jurisdiction, one-half for the benefit of the person or persons, firm or association, or their assigns, upon whom such fraud or neglect shall be committed, first having made complaint therefor, the remainder to the school fund.